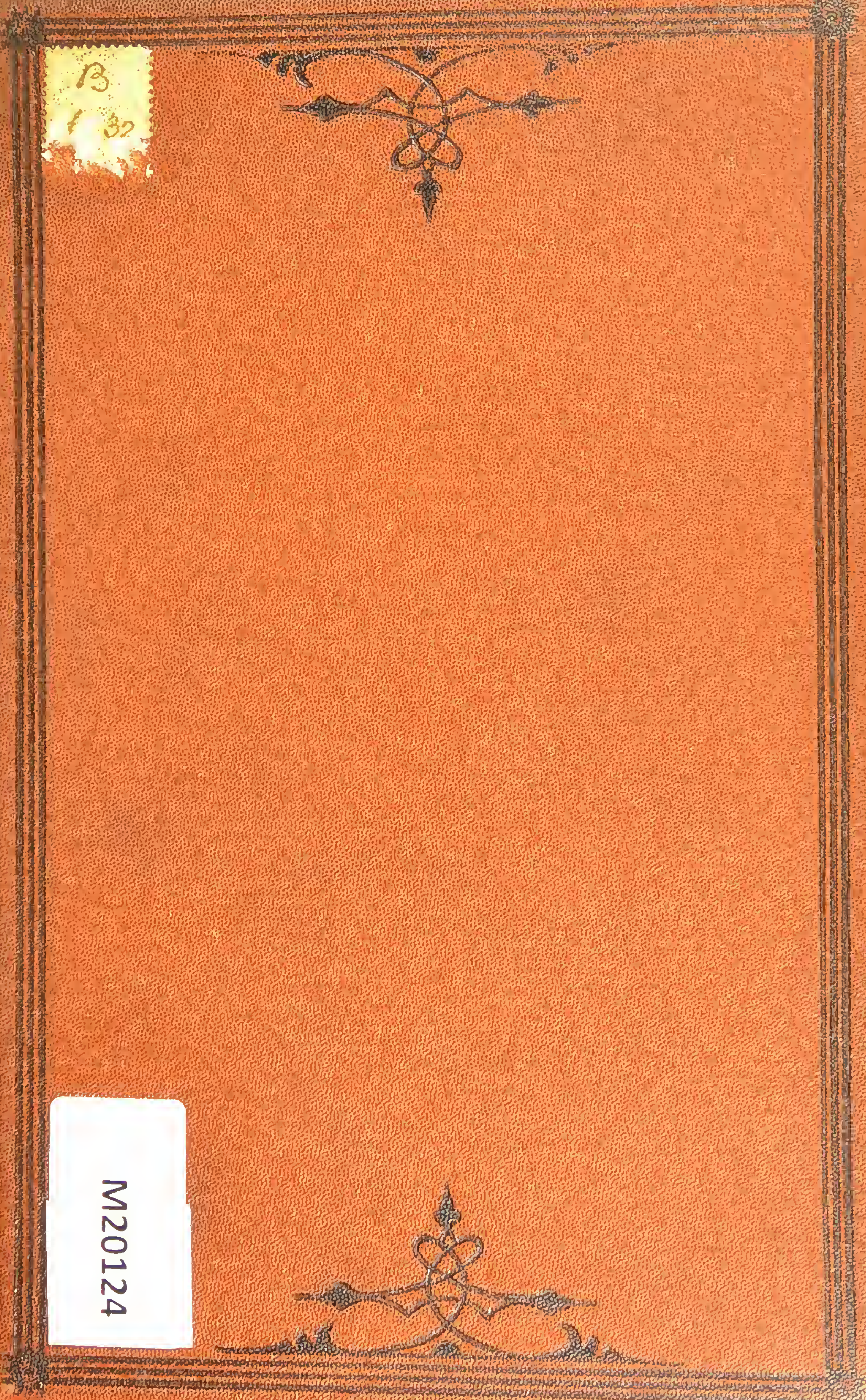

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DEAFNESS

AND

DISEASES OF THE EAR:

THE

CAUSES AND TREATMENT.

BY

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PREFACE.

In offering this work to the Profession, I would most respectfully state that my object, however imperfectly achieved, has been to produce a concise and readable book on the subject of which it treats.

The diagnosis and treatment of Ear Disease has been hitherto much neglected in the medical student's education; and, in after life, in many cases, the practitioner has found himself at a loss how to treat such disease when submitted to his care,—consequently leaving a large field for the operations of charlatanism.

I have endeavoured to avoid all superfluous matter, and have reduced the number of illustrative cases to a minimum. The detail of many cases, in which works on special subjects abound, have little practical value except in swelling the number of their pages.

Where a simple term would do, I have neither taxed my brains nor conned the pages of my dictionary to seek a more learned phrase.

If I have, even in a very small degree, advanced the practice of the special department of surgery in which I am engaged, and the following pages meet with the approval of my professional brethren, my labour will have been amply rewarded.

J. P. PENNEFATHER.

77 Gloucester Place,
Portman Square.

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DEAFNESS,

&c., &c.

ANATOMY OF THE EAR.

THE organ of hearing is divided into three parts. The first or external part is called the auricle; it presents several depressions and elevations on its surface, and is composed of cartilage, muscles, and cellular tissue. It is situated on the lateral part of the head, and is attached to it by muscles and ligaments; it resembles a mussel shell in shape, having its broad end uppermost; its superior and largest portion is chiefly composed of cartilage, and is called the pinna; its inferior, composed of fat and cellular tissue, is called the lobe.

The elevations and depressions observed on the surface of the auricle are named as follow:—

The outer margin or edge is called the Helix or fold, the parallel elevation, the Anti-Helix. The pointed cartilage, protecting the opening into the meatus, is named the Tragus, from the bristly hair which commonly springs from it being supposed to resemble goats' beard. The lobe is that portion which is pierced for the wearing of rings. Between the helix and anti-helix is the fossa innominata or scaphoid fossa. The bifurcation of the anti-helix forms a depression called the triangular fossa or fossa of the anti-helix; all these grooves and ridges converge into a space in front of the meatus which is called the concha, signifying a bivalve shell, such as an oyster or scallop shell.

LIGAMENTS.

The Ligaments which attach the auricle to the side of the head are the anterior and posterior. The ligament between the concha and processus caudatus, which is formed by a continuation of the helix and anti-helix, and the broad ligament which extends from the upper margin of the tragus to the helix, completing the formation of the meatus externus, serve to preserve the shape of the auricle.

The Anterior Ligament extends from the zygomatic process close to the glenoid cavity to the superior part of the cartilaginous portion of the meatus.

The Posterior Ligament extends from the mastoid process to the posterior part of the convexity of concha.

MUSCLES.

The muscles which attach the auricle to the head are the Superior, Anterior, and Posterior Auris. The Superior Auris, named attolens, from its power of lifting the ear upwards, arises broad and circular from the expanded tendon of the occipito frontalis, and is inserted into the back part of the anti-helix.

The Anterior Auris, a delicate thin expansion arising from the fascia covering the zygoma, is inserted into the eminence of the helix.

The Posterior Auris arises by three distinct slips close to the mastoid process, running forward it is inserted into the back part of the concha. This muscle is often named the triceps auris; some writers describe it as two distinct muscles, "Retrahentes." In the human being the power over these muscles is very limited; occasionally, however, it is well developed. Mr. Mery, when lecturing his class on this subject, used to amuse them by moving his ears rapidly. Albinus, who gives his name to one of the muscles of the pinna, was supposed to have the same power. In animals, which nature has gifted with a very acute sense of hearing, these muscles are strongly developed.

There are also intrinsic muscles of the auricle. The major and minor helicis, tragicus, anti-tragicus, transversalis auriculæ, and the oblique muscle, described by Todd, consisting of a few fibres, reaching from the posterior part of the concha to the inner or cranial surface of the triangular fossa.

Helicis Major lying on the outward ring of the helix arises from its upper and acute point, and is inserted into the same cartilage a little above the tragus.

Helicis Minor arises beneath, or lower than the former, above the notch in that part of the helix which projects into the concha, and is inserted below the notch.

Tragicus arises from the middle of the concha, and is inserted into the tip of the tragus.

Anti-Tragicus rising from the anti-tragus is inserted into the edge of the concha at the notch where the helix terminates.

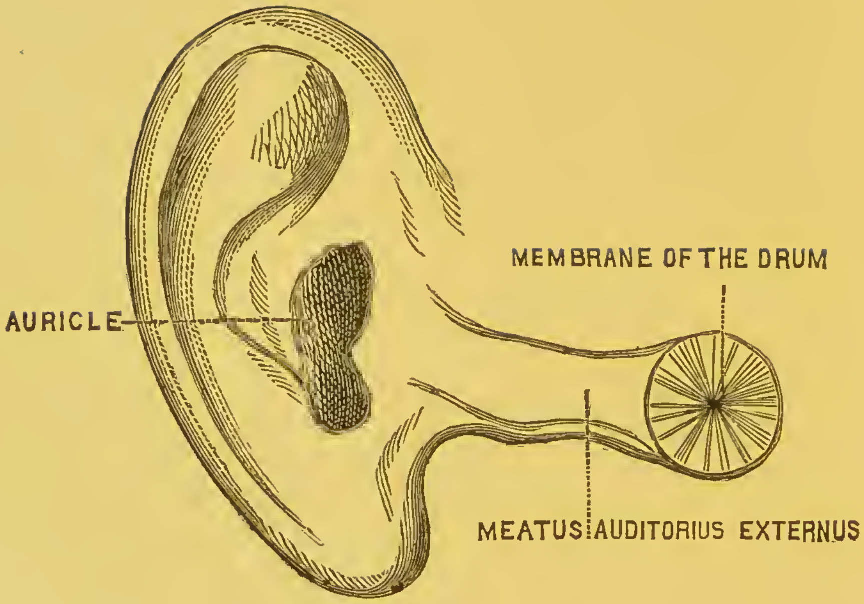
Transversalis Auris of Albinus, consists of scattered fibres on the cranial surface of the auricle, running from the prominent part of the concha to the outer side of the anti-helix.

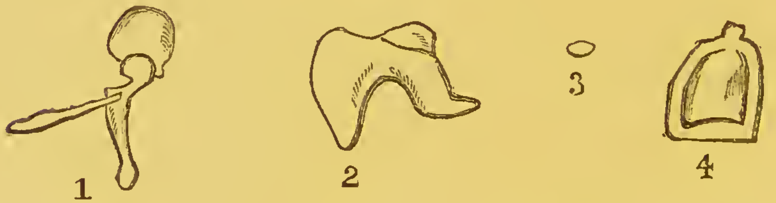
These muscles are supposed to render the cartilage of the auricle more tense, and thus make it more susceptible of receiving and collecting the sonorous vibrations. In testing the hearing power with a watch, I have frequently observed these muscular fibres in a state of agitation, the patient at the time trying his utmost to catch the sound. In a few instances it has been so well marked as to visibly contract the auricle.

Writers, whose opinions must be received with respect, state that the auricle is useless as far as the sense of hearing is concerned. Itard is very positive in this assertion, and cases are recited by Richerand, Henner, Wepfer, and others in support of it.

The late Mr. Toynbee relates a case of a sailor who probably lost his left auricle by a summary process of lynch law, prevalent in California for the punishment of thieves. This man, wishing to return to the country, applied to Mr. Toynbee to aid him in obtaining an artificial substitute. Mr. Toynbee failed to detect the slightest difference in the hearing power of either ear. But it can hardly be supposed that this is the isolated instance in which nature has given a useless appendage to the human structure; a pre-conceived idea requires but slender proof to satisfy the mind of its correctness, and the authors who have advanced this opinion, in the detail of the cases they give, evidently entered on the different tests employed with opinions very much biassed. Valsalva's remark concerning the membrane of the tympanum, applies, though in a less degree, to the auricle. He says that membrane is not essentially necessary to hearing, but only to perfect hearing, The auricle is covered by a continuation of the common integuments, and is pierced by numerous ducts of sebaceous follicles, particularly in the groove formed by its junction with the scalp.

The Meatus Externus, which is included in the outer division of the organ of hearing, is the tube leading from the concha externally to the membrana tympani internally, which membrane divides the outer from the middle ear. From an inch to an inch and a half in length, it takes a direction upwards, forwards, and then slightly downwards, its floor being more prolonged than its roof; the outer portion of this tube is cartilaginous, the inner osseous, forming its largest extent. It is somewhat constricted in the centre, and is lined by skin common to the auricle, and cellular membrane; the skin as it approaches the inner part of the meatus becomes very fine. The surface of the meatus is protected by numerous small hairs, which are occasionallly so redundant as to cause obstructions in the canal. Its lining is pierced by several small ducts belonging to the ceruminous glands.




1 Malleus. 2 Incus-Os. 3 Orbiculare. 4 Stapes.

These bones are largely magnified.

These glands secrete a substance called cerumen, commonly known as the wax of the ear.

In the fœtus, the canal is filled up with a thick white fluid, which protects the membrane of the tympanum from contact with the waters of the amnion. This, after birth, comes away with the ceruminous secretion, but it has been known in some cases to harden and set up considerable irritation.

MEMBRANA TYMPANI.

At the internal termination of this canal is situated a membrane, somewhat oval in shape, its lower being internal to its upper edge, in consequence of the floor of the canal being more prolonged than its roof; it presents a slightly concave surface to the meatus, its convex surface projecting into the cavity of the tympanum.

The Membrana Tympani is composed of three layers, the external or cuticular being a continuation of the lining of the tube. The middle, described by Sir E. Home and Blumenbach as consisting of muscular fibres which radiate from the circumference to the centre. Sir E. Home states that it is principally these muscular fibres which enable the membrana tympani to vary its degree of tension so as to convey the sonorous vibrations in quick succession.

The internal layer is furnished by the mucous lining of the tympanum.

This Membrane is very vascular and highly sensitive, being supplied with abundant nervous fasiculi; in its normal condition it is semi-transparent, somewhat resembling a piece of tissue paper. The handle of the malleus may be readily distinguished, running between its internal and middle layers to a little below the centre where it is fixed.

TYMPANUM.

On removing the Membrana Tympani, we expose the cavity of the Tympanum or middle ear, which is bounded by this membrane externally, and by the labyrinth internally, of a very irregular formation. It presents three well marked eminences and several openings. In its anterior and lower part is the largest, that of the Eustachian tube. On its inner wall may be observed the foramen of the fenestra ovalis, communicating between the tympanum and vestibule, but separated from it by a membranc; it is reniform in shape and directly opposite the opening of the meatus. The fenestra rotunda, triangular in form, is situated below and posterior to the fenestra ovalis, from which it is separated by a long eminence called the promontory or tuber cochlea; it communicates between the tympanum and cochlea, separated by a membrane.

MASTOID CELLS.

The Mastoid Cells are numerous irregular cavities in the substance of the mastoid process. They communicate with each other, and have a common irregular opening into the tympanum, a little above the posterior edge of the orbicular groove.

The other small foramina are the two openings for the entrance and exit of the chorda tympani nerve, the former being situated near the root of the pyramid in the posterior wall, and the point of exit being in the anterior wall at the Glasserian fissure, which is situated in the floor of the tympanum, where is also found the opening for the laxator tympani muscle.

In the anterior wall of the tympanum, above the opening of the Eustachian tube, is the foramen for the tensor tympani, and at the point of the pyramid a bony eminence in the posterior wall of the tympanum, is an opening for the stapedius muscle. There is also a minute foramen in its floor for the transmission of a nervous filament called Jacobson's nerve.

EUSTACHIAN TUBE.

The Eustachian Tube, three parts fibro-cartilaginous, one part osseous, from one to two inches in length, placed obliquely, takes a direction forwards and inwards from its opening into the tympanum, its other outlet being in the upper part of the pharynx, at the outer edge of the posterior aperture of the nares. Through this tube air is supplied to the cavity of the tympanum. It is broader at it's pharyngeal end, and is lined by mucous membrane, continued through it to the cavity of the tympanum. On its use as a component part of the organ of hearing, writers on this subject are not agreed. Some contend that besides supplying air to the cavity of the tympanum, it also communicates the sonorous vibrations, based on the fact, that in endeavouring to catch an indistinct and distant sound the mouth is almost invariably opened. (But this theory a simple experiment which will be found mentioned in the chapter on affections of the Eustachian tube, will effectually disprove.)

Contained in this cavity are four distinct bones, named the ossicula auditus, so united by articulations and ligaments that they form an uninterrupted chain of communication across the chamber, joining the membrane of the fenestra ovalis with the membrana tympani. This chain of bones consists of the

Malleus, or hammer-shaped bone ;

The **Incus**, or anvil-shaped ;

Os Orbiculare, by some anatomists stated to be a process of the Incus ;

And the **Stapes**, or stirrup-shaped bone.

The **Malleus** is situated vertically, and is attached to the internal and upper part of the membrana tympani. It is subdivided into a head, neck, and handle, and also a long process or processus gracilis springing from the neck.

The **Incus**, articulating with the head of the malleus, has superior and inferior process and body; at its extremity is the Os Orbiculare, which no doubt in fœtal life is a distinct bone. It articulates with the head of the Stapes.

The **Stapes** is attached at the foot of the stirrup by a circular ligament to the margin of the fenestra ovalis, and is in intimate relation with the membrane covering the entrance to the vestibule.

MUSCLES OF THE TYMPANUM.

These bones give attachment to the Tensor Membrana Tympani, Laxator Tympani, and Stapedius muscles.

The **Tensor Membrana Tympani** arises from the petrous portion of the temporal bone and cartilaginous portion of the Eustachian tube entering the tympanum by one of the small foramina; it is inserted into the handle of the malleus a little below the long process.

Laxator Tympani, arising from the spinous process of the sphenoid bone, also from the Eustachian tube, enters the tympanum through an opening situated in the Glasserian fissure, and is inserted into the long process of the malleus.

The **Stapedius** muscle arises in the interior of the eminentia pyramidalis, passes through a foramen in it, and is inserted into the posterior part of the neck of the stapes.

Mr. Wilson and some other anatomists give a fourth muscle, calling it the **Laxator Tympani Minor**, but it is generally regarded as a ligament.

The action of the two first muscles is indicated by their names. The stapedius muscle acts on the membrane of the fenestra ovalis.

INTERNAL EAR.

The third and most important part of the organ of hearing is named the internal ear or labyrinth, and is itself divided into three parts. The vestibule, cochlea, and semi-circular canals, the whole being contained in the petrous portion of the temporal bone and lined by fibro-serous membrane analogous to the dura mater, with which it is continuous through the aqueducts of the vestibule and cochlea. These processes of membrane were regarded by Cotunnius as canals through which the superabundant fluid of the labyrinth might escape into the cavity of the cranium.

The vestibule has several apertures besides that of the fenestra ovalis, which communicates between the internal and middle ear. The semi-circular canals and cochlea open into it as well as foramina for the small arteries and nerves. It is triangular in shape, having its base external.

The **Cochlea,** so named from its resemblance to a snail shell, is situated at the fore part of the vestibule, and consists of an osseous tube coiled round a pillar. This pillar being of spongy structure and consisting of two parts, modiolus the lower part hollow containing a branch of the auditory nerve is pierced by minute holes for the nervous fasiculi. The upper part of the pillar is called the infundibulum. The tube of the cochlea is divided by the lamina spiralis, a partly bony and partly membranous septum into two canals called scalæ.

The **Semi circular Canals** are three small bony tubes, situated behind the vestibule and communicating with it by five apertures.

The superior or perpendicular canal joins with the middle or oblique canal, having a common opening. The inferior or horizontal, shorter than the other two, communicates with the vestibule by both extremities. The labyrinth is sealed from all external communication by membranes. It contains soft membranes forming sacculi and tubes enclosing a fluid resembling the aqueous humour of the eye, among which are distributed the minute branches of the portio mollis nerve, as well as two cretaceous bodies called otoconites, consisting of minute particles of carbonate of lime.

NERVES.

The Nerves supplying the ear, are the portio mollis or auditory nerve, the portio dura, the vidian, a branch of Meckel's ganglion, Jacobson's nerve, the tympanic branch of the glosso pharyngeal, and the Otic ganglion, discovered by Dr. Arnold, of Heidleberg.

The **Portio Mollis** arises from the lineæ transversæ, at the floor of the fourth ventricle, winds round the corpus restiforme, from which it receives some fibres, to the posterior edge of the crus cerebelli, being joined by the portio dura they enter the meatus auditorius internus where it receives several filaments of the facial and is distributed to the labyrinth and its contents.

The **Portio Dura**, or facial, continues its course through the aqueduct of Fallopius, receiving a petrosal branch of the vidian; it descends along the inner wall of the tympanum, emerging at the stylo-mastoid foramen, to be eventually distributed on the side of the face.

The **Vidian,** a branch of Meckel's ganglion being its posterior communicating branch, passing through the vidian canal divides into two branches, carotid and petrosal. In the Hiatus Falopii, the petrosal branch of the vidian receives a twig from Jacobson's nerve, and in the pterygoid canal sends off a filament to the otic ganglion.

The **Chorda Tympani**, a branch of the facial, given off just before this nerve leaves the stylo-mastoid foramen, enters the tympanum at the base of the pyramid, crosses that chamber, and escapes to join the gustatory through a foramen, the canal of Huguier in the Glasserian fissure.

It is this nerve which may be wounded in the operation for perforating the membrana tympani.

The **Otic Ganglion** is described by Arnold to be situated immediately under the foramen oval, on the inner side of the third division of the fifth pair; it sends a filament to the tensor tympani muscle, and another filament entering the tympanum communicates with Jacobson's nerve.

Jacobson's Nerve, the tympanic branch of the glosso-pharyngeal, enters a small foramen in the ridge which separates the jugular fossa and the carotid foramen, forming, with the sympathetic and fifth pair, the tympanic plexus; it is distributed to the walls of the tympanum, the membranes of the fenestra ovalis and rotunda, and the Eustachian tubes.

ARTERIES.

The Arteries which supply the external ear are the posterior and anterior auricular; the tympanum derives its supply from the internal carotid, internal maxillary and the posterior auricular, which gives off a stylo-mastoid branch entering the tympanum by the foramen of that name, and is distributed to it and the aqueduct of Fallopius.

The labyrinth is supplied by one of the transverse branches of the basilar and by the stylo-mastoid branch of the posterior auricular. The blood from this structure is returned by two small veins which pass through the duct of Cotunnius.

COMPARATIVE ANATOMY.

Before proceeding to consider the diseases of the organ of hearing, a brief sketch of the comparative anatomy and physiology of this delicate and wondrously beautiful structure cannot be out of place. De Blainville's division of the ear is that most adapted for this study. He divides the organ into four parts: the vestibule, the cochlea and semi-circular canals, the tympanum, and the external ear.

Though in insects there is no trace of the organ of hearing, it is generally allowed that the insect creation are not insensible to sound, and that the perception is conveyed to them by the exquisite sensibility of their antennæ on which the aerial undulations are supposed to act. In the lower orders of the animal creation, commencing with zoophytes, the sense of hearing is entirely absent. But from the zoophyte to perfect man the different degrees of development of this organ can be readily traced.

In the mollusc, the auditory organ consists of two small membranous vesicles.

In the next order, crustacea, the lowest of the articulate animals, we find the vestibule covered at the base of their antennæ by a membrane analogous to the fenestral membrane of a higher creation; the vestibule contains fluid in which is expanded the terminal extremities of the auditory nerve.

In fishes, the organ of hearing is composed of a vestibule and three semi-circular canals. Sound is conveyed by vibrations of the common integuments and bones of the cranium, in the cavity of which the vestibule is situated. But it must be remembered that fish live in an element the best of all sound-conductors, and what would be almost indistinct with air as the medium of conduction becomes plainly audible in water. This may be readily proved by anyone who has learned to dive, clashing two hard substances together when under water.

Reptilia have a rudimentary cochlea and imperfectly formed tympanum, which is described by Milne Edwards as a sort of dependance upon the pharynx.

In birds, another step in the formation of a perfect organ is to be found in the external auditory canal. The tympanum communicates with the diploe of the cranial bones, which are filled with air instead of medulla. It contains a bone analogous to the ossicula, which adheres to the vestibular membrane.

In mammalia, we arrive at a perfectly formed organ of hearing, consisting of an external ear or auricle, and an external auditory canal, a perfectly formed tympanum, and an internal ear or labyrinth. But we find different degrees of development of the auricle.

In aquatic mammals it is necessarily small, and in carnivorous animals it is usually smaller than in herbivorous. We thus trace the development of the auditory apparatus from its rudimentary stage through the different classes of creation, finding each part added according to the requirements of the animal, until we find the entire structure in the mammalian class, which includes man, whose superiority in this sense is not due to organic, but to a higher sensorial development.

Sound is produced by the vibrations of the aerial undulations striking on the auricle, collecting in its sinuosities, which will be found to empty themselves into the concha; they are there concentrated and discharged into the meatus auditorius externus, through which they are conveyed to the membrane of the tympanum; receiving the impulse, this membrane vibrates correspondingly with the strength of the impressions, and, by means of a chain of bones, called the ossicula, which are intimately connected with the membrane by the attachment of the malleus, the impulse is transmitted through these bones to the membrane of the fenestra ovalis by means of one of the chain called the stapes, the base of which is attached to this membrane and plugs as it were the entrance to the internal ear. Acting on the fenestra ovalis membrane, the impulse is conveyed to the liquor labyrinthii, in which the terminal filaments of the auditory nerve are distributed by them to the trunk of the nerve, and thence to the sensorium.

It will be seen there is a gradual concentration of force, the aerial undulations, proceeding from the sonorous body, floating in the elastic air, are gathered by the auricle; they are then concentrated in the concha, and discharged through the external auditory canal on the membrane of the tympanum, which, from its formation, beingc omposed of concentric fibres radiating to its circumference, is again peculiarly adapted for further concentration, which it communicates to the ossicular chain. Their attachment to the membrane and articulations with each other is so arranged, that their vibration is a multiple of that received from the membrane, which they communicate to the nervous filaments through their attachment to the fenestra ovalis membrane.

The conception of sound is, therefore, when the various structures composing the organ are normal, regulated by the power of the inceptive aerial undulations. The elasticity of the air in the tympanum, and its communication through the Eustachian tube, afford a certain protection against injury to this part of the structure from over-violent vibrations. The internal ear being filled with a fluid so little expansive as water, would communicate the degree of force transmitted through it to the auditory nerve, but this is provided for in the intricate formation of the labyrinth and the outlet of the foramen rotundum, which is covered by an elastic membrane at its opening into the tympanum. Thus the vibration of the fenestra ovalis membrane oscillates the fluids contained in the windings of the labyrinth, commencing at the foramen ovalis and continuing through its sinuosities in an unbroken wave until it arrives at the elastic covering of the foramen rotundum, which yields more or less according to the force of the sonorous vibrations. I am inclined to think that a rupture of the membrana tympani, which we occasionally meet with, the effect of violent undulations, is as often due to the reflex action of the current as to the positive force exerted on the external surface of the membrane.

The anatomical structure of the ear does not clearly reveal to us the power which we possess of receiving so many variations of sound, the human ear being capable of perceiving many hundred distinctions, and, in its healthy condition, an equal number of degrees in strength.

The variety of sensations received would seem to depend on the different filaments of the nerve, as the vibrations are conveyed through the windings of the labyrinth. That the cochlea is that portion of the internal ear which imparts this power, comparative anatomy teaches us.

In reptilia, where we find for the first time a rudimentary formation of this structure, we also find a susceptibility to musical impressions, which is taken advantage of by the snake charmers of India, who, by means of musical sounds, entrance the most venomous reptiles.

In the lower orders of creation, possessing the faculty of hearing, but where the organ consists of the vestibule only, or in fishes, where we find both vestibule and semi-circular canals, harmonic vibrations exert no influence, but as soon as even an imperfect cochlea is arrived at, melodious undulations are perceived.

For the mere purpose of hearing, the sac of the vestibule is sufficient, but for the perception of exquisite sensations, as well as for the highest cultivation of the sense, as in the human creation, the composite organ, as revealed in the study of human anatomy, is entirely and essentially necessary.

The ear performs a large and important part in the government of the body. In herbivorous animals it is in most instances their sole means of defence, as they rely on the acuteness of hearing with which an all-wise Providence has gifted them, for timely notice to escape danger. In man, not only does the ear determine from whence sound comes, but it is equally correct in estimating the distance the sound has travelled, by the force of the undulations conveyed to it. It imparts more true enjoyment to our existence than any other of the senses is capable of doing, and exercises a much greater influence on our bodily operations. The motions of our limbs in dancing or marching to the sound of music is regulated by the ear; so long as the undulations are grateful and harmonious to the sense, the bodily actions are in perfect unison, but on the occurrence of the least discord, which offends the exquisite sensitiveness of the organ, the regulating power is suspended, and the bodily movements become vapid and irregular. It has been a subject of dispute whether the sense of audition or that of vision takes precedence. No doubt, in early life, audition is the most important sense of the two, for if absent, the perfect faculty of speech is also wanting.

In adult life, the two senses act in such complete harmony, that the impairment of either is antagonistic to the perfect efficiency of the other. When once speech has been thoroughly acquired, the perfect power of which is entirely dependent on the sense of hearing, deafness is preferable to blindness, inasmuch as the eye is more capable, to a certain extent, of supplementing the lost sense of hearing than the ear is that of vision.

The strong sympathy between the two organs frequently manifests itself under diseased conditions. Patients, who under the oculist's care have been relieved of their complaint in the eye, frequently find it necessary to apply to an aurist for an affection of the ear, which would seem to be transferred to it, and *vice versâ.* To sustain both organs in their perfect efficiency is the surgeon's aim. Ophthalmic surgery has made rapid strides towards perfection within the last few years, while its sister science, aural surgery and medicine, has made but slothful progress—attributable, no doubt, in a great measure, to the peculiar feelings which have so long existed among the medical profession in regarding the practitioner of this important specialty in a doubtful spirit. This feeling, founded on ignorance, is fast passing away, and the man who scientifically and conscientiously endeavours to alleviate suffering, which we so often hear characterised by the sufferers themselves as distressing and intolerable, deserves the same recognition as his fellow-labourers in the other paths of medical and surgical science. An incentive to exertion for all lies in the fact, that though anatomists have so fully revealed the organic structure of the ear, the different affections to which these structures are liable have, to a great extent, been treated in an empirical manner, that no plain, straightforward course has been generally adopted, but each one has pursued a particular method, which not only causes confusion, but engenders distrust of the whole. Though every work on aural surgery contains several chapters on deaf mutism, yet not one single fact of any importance in its treatment has from the earliest ages of medicine to the present time been promulgated.

DISEASES OF THE AURICLE.

The integuments of the auricle, being continuous with those of the whole body, are liable to all the different cutaneous affections described by dermatologists, the auricle being either primarily attacked, or, as is more frequently met with, implicated in the disease by the process of extension.

The cutaneous diseases most frequently met with in the auricle are herpetic and eczematous eruptions and erysipelas. Herpes and eczema are very commonly met with in children, particularly in the poorer classes of large towns; they are frequently sympathetic with dentition and alimentary irritation, often assuming a very obstinate character.

ECZEMA.

The onset of eczema is marked by an inflammatory blush, with a tingling and burning sensation of the organ; small acuminate vesicles rapidly form; bursting, they discharge a clear serum, which, according to the nature of the eruption, forms either a dry crust or scab, or assumes a purulent character, a fetid, unhealthy secretion exuding from it. This form of eczema betrays a marked tendency to spread. I have observed this affection in several instances among females when the periodical uterine flow is ceasing; it is then generally regarded as an opportune occurrence, and an effort of nature to smooth the dangers which by some are supposed to be connected with this epoch. In these cases there is generally a great disinclination to allow of any remedial measures for the cure of the disease; it is thus allowed to run on unchecked, resulting in serious mischief. When the auricle is attacked, the disease spreads inwards, affecting the external auditory canal, and involving the membrane of the tympanum.

In the treatment of eczema, the constitutional cause must first be sought for. In this, as in many other affections of the auditory structures, local remedies are powerless to cure, unless that morbid condition of the system which produces the disease be sought out and rectified; should the eruption be traced to irritation consequent on dentition, suppression of the discharge, by the use of astringent applications, may possibly be followed by convulsions or other cerebral mischief; in such cases the Hyd. c. Creta in small repeated doses, according to the age of the patient, with the decoction of sarsaparilla, and observance of strict cleanliness, will generally effect a cure. I have known it, however, to resist all treatment, and as soon as dentition was completed, rapidly disappear.

If the disease present itself in a female in sympathy with the uterine functions, the eczematous eruption must be in no wise regarded as a favourable occurrence, it is desirable rather to promote than cure; on the contrary, it is positive evidence of a careful systemic treatment being required.

This disease occasionally assumes a highly inflammatory character, and requires the employment of antiphlogistic treatment. In those cases of a purulent nature betraying an æsthenic condition of system, a nutritious diet, with the administration of tonics, bark, and the mineral acids, is indicated. In every form of eczema, topical fomentations are both beneficial and grateful to the patient; due attention to the alvine secretions is imperative.

The form of herpes affecting the auricle, phlyctenodes, is distinguished from eczema by its more rapid formation; the treatment differs but little from that described for the preceding affection.

Erysipelas is the most formidable of the cutaneous affections of the auricle, from the rapidity with which it extends internally, implicating important structures; it is met with in two forms, acute and chronic. If the inflammatory symptoms run high, antiphlogistic treatment is necessary.

Patients suffering from chronic eczema and a bastard form of erysipelas, are those which most frequently come under the care of the aural surgeon, and then not for the eruption, but for the deafness, which its long continuance has resulted in, by the blocking of the external auditory canal and thickening of the membrane of the tympanum, which is sure to occur if proper means are not employed to stay the progress of the disease. These cases are usually met with in weak and delicate constitutions, accompanied with a costive habit. Here a combination of iron and aloes with nourishing diet soon exercises a beneficial influence; the affected structures should be brushed over daily with a solution of nitrate of silver, five grains or more in an ounce of water.

It is not the purpose of the author to enter into a minute description of the symptoms and treatment of those diseases which, though occasionally attacking the ear, are common to the whole body; the object in mentioning them is to combat the erroneous idea, that at certain periods of life, these eruptive diseases should not be interfered with. When the auricle is implicated, their tendency is to spread inwards through the canal, and the result is not unfrequently irremediable deafness. For an able article on the nature and treatment of eczema, I refer my readers to Dr. Tilbury Fox's Lettsomian Lecture, *Lancet*, April 9, 1870; also to an article in the same journal, May 14th, 1870, from Dr. M'Call Anderson, of Glasgow, advocating the internal administration of carbolic acid in the treatment of eczema. Dr. Anderson illustrates his paper by several cases in which the administration of this preparation was attended with the happiest effect; the dose he prescribed was ten grains three times a day before meals. I have had several opportunities of trying its efficacy since I read Dr. Anderson's article, and have had every reason to be pleased with the results ; together with the internal dose, I advise an unguent composed of carbolic acid one drachm, glycerine three drachms, zinc ointment one ounce, to be smeared over the auricle twice daily, and if the lining of the meatal canal is affected to be introduced with a camel's hair brush up to the membrane.

Lupus is occasionally met with situated in the auricle; it is to be treated by the internal administration of arsenic.

Pemphigus gangrenosus, described by Sir William Wilde, of Dublin, is, as the name implies, a very serious affection, but fortunately a rare one ; it is caused by the combined effect of uncleanliness and insufficient nourishment, and is to be combated by generous diet and tonics.

Tumours of various natures are met with in the auricle, sometimes attaining such a size as to render their removal necessary. Dr. Graves has described a gouty hypertrophy of the lobe. I have in several instances observed a rheumatic thickening of the cartilage forming the helix. A scirrhus affection of this structure sometimes occurs, and has been met with resulting from long neglected skin disease. In such cases removal of the affected part, and in some instances the entire auricle, is required. Such a case is related in Kramer's work on diseases of the ear. A country boy, when eight years of age, suffered from a scaly eruption on the head, implicating the external ear ; its itchiness compelled him to scratch it rather roughly ; the skin was rubbed off, the auricle becoming swollen and red. It remained in this condition for some time, but the disease again became active, involving the whole auricle, which was converted into a knotty deformed mass, suppurating at the margin of the anti-helix. Dr. Fischer removed the entire auricle, the wound healing up in six weeks.

Nævi, implicating the auricle, particularly the lobe, are not unfrequently met with. I have lately seen a large growth of this description in an infant, extending from the parotid gland to the lobe, the whole mass strongly pulsating. Pressure on the carotid of that side controls the tumour. The daily application of ice and tincture of iodine seems to have slightly diminished its size, but whether it will prove of permanent benefit I cannot yet say.

AFFECTIONS

OF THE MEATUS AUDITORIUS EXTERNUS.

The external auditory canal is subject to a variety of affections, which during their continuance almost always interfere in a greater or less degree with the hearing power, and not unfrequently result in its permanent impairment; as before shown, all skin diseases affecting the auricle soon implicate the lining of this canal.

A peculiar warty excrescence springing from the margin of its external orifice, and in some instances completely closing it, is one of the morbid conditions met with. I have not been able to find any allusion to this affection in the various works on the subject of ear disease, but I have lately met with it for the third time, and have at the present under my care a young girl who suffered from it in a very aggravated form, the external orifice of both ears being completely blocked up by this verrucosus growth, barely admitting a small probe, which, on withdrawal, was covered with offensive secretion. There was also considerable loss of auditory power. As there was some difficulty in her attending regularly, being a domestic servant, and, unless soon relieved, was under a threat of dismissal from her situation, instead of employing any escharotic application I cut out the growths, which formed a complete ring; the surfaces soon healed. A lead lotion dropped into the canal for a few days removed the mischief there, and hearing became perfectly restored. In any future cases I may meet with I shall pursue this plan, as more expeditious and effectual than the employment of caustics.

Inflammation in the meatus externus, arising from exposure to cold and wet, is a common affection, as well as its metastasis to this part during the course of some one of the exanthem. Rheumatism and gout are productive of inflammation in its structure, and some authors mention gonorrhœal matter as another cause.

Abscess, which always occurs in the outer portion of the tube, and is generally found to be situated laterally, is a common cause of most painful inflammation. Periostitis and caries are happily of comparatively unfrequent occurrence. Different forms of polypi are met with in the auditory canal. It is sometimes found to be blocked by interstitial and osseous depositions, and its outer cartilaginous portion is occasionally found to be collapsed, the orifice of the meatus presenting a slit-like depression, this condition being generally a concomitant on senility.

There is a gelatinous white substance which fills the canal in the embryo protecting the membrane of the tympanum from the surrounding fluid, which occasionally remains in the canal after birth, and hardening, sets up considerable irritation.

Otorrhœa, a product of some one of the foregoing or from other causes, which will be fully treated of in another chapter, is by far the most frequent affection of the external auditory canal for which the practitioner is consulted.

An acute attack of inflammation occurring in the meatus externus is characterised by considerable augmentation in the temperature of the part, and at first a troublesome itching. On inspection the meatus will appear devoid of all cerumen, and presents a pink, shiny appearance, intensely tender to the touch; or there may be such considerable tumefaction that a view of the canal cannot be obtained; the itching will soon give way to severe lancinating pain, followed by a sero-purulent discharge which will be seen exuding from the meatus externus. As soon as this discharge makes its appearance, the severity of the pain is generally much mitigated. Occasionally such cases will, if allowed to proceed unchecked, engage the tympanic cavity, internal ear, and brain, ending in the patient's death. The particulars of such an instance were detailed to me some time since by a surgeon practising in the south of Ireland. A country gentleman in the enjoyment of robust health, attended an early fair on a cold, raw morning; on returning home, he complained of stiffness in the neck and a slight pain in the ear; this gradually increased to the most intense agony. He was dosed with laudanum, a piece of roasted onion crammed into the meatus, and not until the following afternoon was my informant sent for; the gentleman was then comatose, and died that night. Fortunately such a termination is of rare occurrence, but it is well to bear in mind that it is possible, and by the use of applicable remedies timely employed may with certainty be prevented.

In mild forms of inflammation arising in the meatus externus, warmth applied by means of hot foments, surrounding the head with flannel afterwards, and the administration of a saline aperient, will usually prove sufficient. Severer cases will require the application of leeches to the orifice of the canal; and again, formidable cases will sometimes occur requiring the strictest antiphlogistic treatment, with local and general blood-letting.

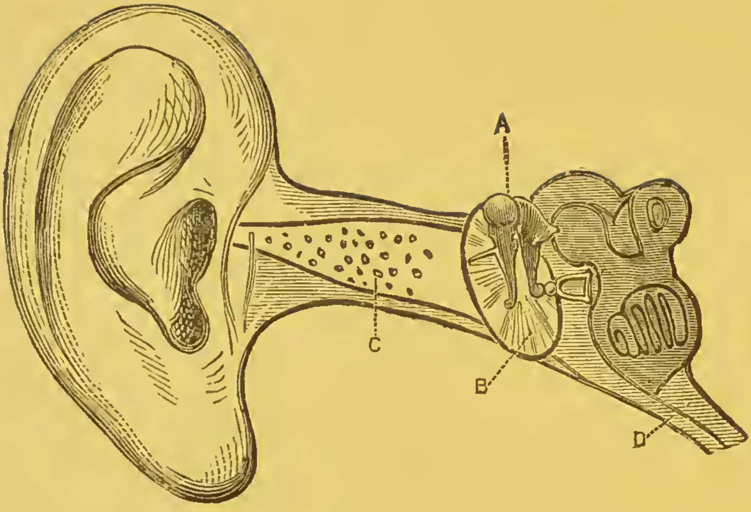
This affection is sometimes so slight as to occasion no feeling of discomfort beyond the itching sensation, which is usually followed by a thin watery discharge, which gradually subsides without any treatment, or readily yields to some mild astringent injection.

Inflammation arising from the presence of a foreign body in the canal, or what is more frequent, from the rude attempts made for its extraction, must be treated on the same principles as those laid down in the idiopathic form. When inflammation of the lining of the meatus externus occurs during the presence of exanthematic disease in the system, the specific treatment for its control must be employed, as well as that for the systemic disease. In many of these cases it becomes a grave complication, and one which is too frequently either ignored or unsuspected, particularly in cases of scarlatina, when the inflammation of the faucial lining has extended through the Eustachian ducts tō the middle ear, and thence to the external auditory canal. When considering the diseases of the tympanum, this complication will be more fully treated of.

Rheumatic and gouty inflammations must be diagnosed by an existing predisposition in the system to one of these diseases. In rheumatic inflammation, pain will usually engage the whole side of the head at the onset. Besides local applications to the meatus, the preparations of colchicum will be found very efficacious in subduing the severe pain complained of in many of these cases.

Gonorrhœal inflammation hardly requires notice in a work on the ear. That it may be possible to produce a discharge from the meatus by the introduction of gonorrhœal matter from the urethra, I am not prepared to deny, never having seen or heard of such a case; its occurrence is extremely hypothetical.

Furunculi in the outer and cartilaginous portion of the meatus externus are a prolific and most painful source of inflammation in the canal; they are generally situated laterally, about the size of a duck shot, but may attain to much larger dimensions; the attendant pain is very severe. They partake much of the character of an hordeolum, suppurating slowly; this process should be expedited as much as possible by hot fomentations. I not unfrequently direct a leech to be



A. Ossicles. B. Membrana.

C. Ceruminous glands. D. Eustachian tube.

applied to the inner surface of the tragus with much benefit. As soon as matter has formed, a small incision should be made into the swelling, and the contents, consisting of yellow pus and some shreds of dead cellular tissue, pressed out by means of a probe. Though this seems an unimportant affection, the pain it produces is very disproportionate to the cause, and the patient relieved from suffering will not pause to criticise the importance of its origin ; it will suffice to the sufferer that the measures prescribed have had the desired result, and attention to a small matter may turn out of great consequence to the surgeon. We rarely find in these cases a single boil; there is usually a succession of them, and it will be necessary to prescribe alkaline alterative medicines.

Sir W. Wilde suggests that the tumour should be rubbed over with solid nitrate of silver so as to blacken the skin, with a view of preventing the suppurative action. If seen in its very earliest stage, which it rarely is, this may prove beneficial; but analogous as this affection is to a stye on the eye-lid, resolution rarely occurs. There is early death of some portion of cellular tissue, and it is more desirable that suppuration should take place, and this substance be discharged, otherwise it either becomes a nucleus for another abscess, or forms a hard indolent tumour in a canal which bears no diminution in its calibre without some ill effect resulting. The local treatment will consist in the application of hot fomentations, steaming, and the early opening of the abscess, with, as before stated, when the attendant pain is very severe, the application of one or more leeches.

PERIOSTEAL INFLAMMATION.

Periosteal inflammation in the meatus, is occasionally met with, usually occurring in scrofulous or unhealthy children ; it may, however, arise from gout, rheumatism, syphilis, during the progress of some exanthematic disease in the system, and from long-continued and neglected otorrhœa, occasionally terminating in necrosis and exfoliation of the bony parietes of the canal; it not unfrequently causes a deposition of bone, partially blocking up the canal. In its acute stage, leeches, hot fomentations, and aperients must be employed; occasionally it will be requisite to put the patient under mercurial influence. Counter-irritation behind the auricle, and, when the acute symptoms are subdued, full doses of the hydriodate of potash or colchicum, should be administered. The green iodide of mercury, in small doses, in combination with bark, is of much value in this disease, particularly in removing its after-consequences.

The acute disease is not that for which the aurist is generally consulted. Offensive otorrhœa and deafness are the cause of complaint, and the surgeon will then detect denuded or dead spicula of bone in the meatal canal; or neglect of the disease may have led to implication of the mastoid cells,—a condition of the gravest importance, which will be considered in a subsequent chapter. The scrofulous form of this disease must be combated more by constitutional than local treatment. It must be a matter of surprise to all surgeons acquainted with ear diseases, how slight is the diminution of hearing power we sometimes find caused by necrosis and exfoliation of the bony parietes entering into its structure.

A short time since, a child of two years old was brought to me. The mother stated that the child screamed loudly whenever the nurse attempted to wash the right ear, which appeared tender and slightly swollen. An offensive discharge filled the canal. After cleansing the part, a piece of bone became visible, which, on extraction, proved to be a portion of the mastoid, of considerable dimensions, taking the age of the child—two years—into consideration. The discharge soon ceased, and the child seems well and healthy; nor can I detect much difference between the hearing power of either ear; but from the age of the patient it is difficult to prove the point satisfactorily. She can certainly hear very fairly with the diseased organ.

The history I received with this case is of considerable practical importance. The child a few weeks after birth seemed to be in great pain, rolling the head from side to side, but had not any convulsions. In a day or two after the symptoms manifested themselves, the nurse observed a discharge trickling from the external meatus, but very wisely was content with keeping the part well cleansed. No advice was sought until the patient was brought to me; from the time the disease commenced until I saw her, the otorrhœa had never entirely ceased, but was at times considerable, then almost disappearing, which led the parents to suppose it arose from dentition, and had better not be interfered with. I believe it was entirely due to the hardening of the creamy substance, before alluded to, found in the meatus externus in fœtal life. A little warm oil dropped into the orifice, and very gentle syringing, would have subdued all irritation, and obviated consequences which will rarely turn out so favourably as in the case recorded.

In all cases of infantile ailments where the head is evidently the seat of pain, it will be a wise precaution for the surgeon to gently inspect the meatus. If there the mischief lies,—and in not a few cases it will be found to be so—simple local treatment will rapidly remove what the usual method pursued in infantile head affections—which are almost invariably ascribed to either intestinal irritation or the process of teething—will fail to accomplish. It is not irrational to suppose that a structure endowed with such exquisite sensibility as the organ of hearing, and which in adult life is so frequently the seat of pain, is in infantile life even more susceptible of various affections.

POLYPUS.

Polypi are generally supposed to be peculiar to the mucous surfaces, being most frequently met with in the nose, vagina, and uterus; but in the ear we find them springing from the outer covering of the meatus auditorius, which is a prolongation of the skin investing the auricle. Mr. Hinton, in his supplement to Toynbee's work on the ear, contends that polypi usually spring from the mucous lining of the cavity of the tympanum; but this idea is incorrect, for in numerous cases where I have removed these growths, both in private practice and at the Ear Institution, the unusual and rare exception is to find one of them springing from either the membrane of the tympanum, or from the mucous lining of the tympanum itself. Polypus in the meatus is always attended with more or less discharge, occasionally of a very offensive character; when small and of slow growth, it may exist for a long time, causing only slight inconvenience; and it is only when either the tumour has arrived at sufficient dimensions so as to be visible to the patient's friends, or as the discharge becomes profuse or offensive, that advice is sought for. In some cases tinnitus and symptoms of cerebral congestion arise from pressure of the growth on the membrana tympani.

Polypi may be divided into three orders: the mucous polypus, the hydatid polypus, and the fibrous polypus.

The mucous or gelatinous polypus is a semi-transparent, yellowish substance, slightly vascular, and with very little sensibility. It is attached by a narrow pedicle. There are several methods for the removal of polypus, advocated by different authors. Kramer suggests their being snipped off, and the roots touched with nitrate of silver or some other caustic. Sir W. Wilde recommends snaring them, and has invented an ingenious instrument, consisting of a fine steel stem, five inches long and bent in the centre, with a moveable bar sliding in the square portion near the handle, which latter fits over the thumb. The upper extremity is perforated with holes running parallel with the stem, with loops at the angle. A fine wire fastened to the cross-bar passes through these loops and holes. When the cross-bar is drawn up tight to the handle, the ligature is put upon the stretch. When in use, the cross-bar is pushed forward, and a noose made of the wire, at the small extremity, of sufficient size to surround the tumour, to the root of which it is depressed by means of the stem. The cross-bar is then drawn up smartly to the handle, while the extremity of the stem is pressed downwards, cutting across the portion included in the noose. Mr. Toynbee used an instrument which he called the lever-ring forceps. But I agree with Mr. Harvey, that a fine long-bladed forceps (such as is described, fig. 14, in his work on the ear) is the simplest instrument, and is as, if not more, effectual than either Wilde's or Toynbee's. For the removal of these growths from the walls of the meatus, fix the instrument as near to the root of the body as you can, and by slowly rotating, you twist it out at the very base of the pedicle, whereas, either by knife or écraseur, the root of the pedicle is left untouched, necessitating the repeated application of escharotics. In hospital or dispensary practice, as soon as the growth is removed the patient will probably not take the trouble to attend again; consequently, the tumour is speedily reproduced. The method I advocate will rarely require, when properly performed, more than one application of a caustic.

In those cases where a polypus springs in whole or in part from the membrane of the tympanum, I consider instrumental interference should not be resorted to, but the morbid product should be destroyed by antimonial or other applications.

The Hydatid or Cystomucous Polypus. The "raspberry polypus of Toynbee" differs from the former in its early growth, being of a dark red colour and very friable in its nature; it consists of cells filled with blood, but as the growth becomes larger it loses much of this character, and assimilates in appearance to the gelatinous polypus. Sir A. Cooper recommends the daily application of the muriate of antimony until completely destroyed.

Fibrous polypus, springing from the walls of the meatus, must be removed in the same manner as the gelatinous form, and will require a strong instrument. In some cases of polypus, particularly among children, I have used a plug of cotton wool soaked in a solution of tannic acid or sulphate of zinc three times daily, and kept in contact with the growth; in this way I have succeeded in several cases in effecting its complete dispersion. In dealing with these cases, in patients of tender years, where the polypus has not attained a large size, a trial of this method, before resorting to instruments, may prevent the necessity of an operation.

DEPOSITIONS IN THE MEATUS.

The canal of the meatus is occasionally found to be almost blocked up from accumulated matter which seriously affects the hearing power. In some of these cases, on examination with the speculum, the rays of light, instead of being thrown on the membrana tympani, reveal what, to an inexperienced or hasty observer, would appear to be this membrane perforated. Occasionally it requires close observation on the part of the surgeon, who makes ear affections his particular study, to detect the true nature of the case. The long continuance of sub-acute disease has resulted in a circular deposition in the canal, forming to all appearance a membrane, but never entirely perfect: generally the hole is in its exact centre. The simplest and most effectual treatment will be dividing the substance in different directions and introducing a plug of cotton wool soaked in a weak solution of carbolic acid. It will take a considerable time to restore the lining of the meatus to a healthy condition, and until cerumen is again secreted, for in this condition it is usually entirely suspended, irritation should be kept up behind the auricle by means of some irritating liniment or unguent.

Collapse of the cartilaginous portion of the meatus seriously impairs the power of audition; it is comparatively a rare affection, and is only met with in persons of advanced years. A properly fitting tube, restoring the patency of the canal, is all that will be required in the way of treatment.

Enlargement of the bony canal, in some cases completely occluding it, is also met with; I have seen such cases where great benefit had resulted from the long-continued administration of iodide of potash. In one instance, the patient, a watch-maker, was entirely deaf in the left ear, the meatus presenting a mere slit inside the external orifice. I saw this patient afterwards, when considerable absorption of the bony growth had taken place, and distinct hearing for seven or eight inches from the left side of the head had returned.

OTORRHŒA.

The various affections occurring in the meatus auditorius externus give rise to what becomes a disease *per se*, and is called otorrhœa. In many cases this discharge proves of a very obstinate character, for a long time resisting treatment; though met with at all periods of life, the majority of cases are found occurring in young people. The disgusting, but at one time very prevalent idea, in the wisdom of non-interference with the discharge, and the dangers to be apprehended at its cessation, is happily dying out; but even now a by no means unfrequent question is addressed to the medical man as to whether it may not be very injurious to the child's health to attempt to cure this often loathsome affection. Frequently this groundless fear has condemned the child to suffer, without even an attempt at curative means, until either the discharge has become an intolerable nuisance to the friends and parents, or its continued neglect has given rise to other and more serious disease in the aural structures.

This mischievous idea with regard to otorrhœal discharges is not always confined to the poor and ignorant; the question as to the expediency of curing it has been put to me by persons in a superior position in life, who at last, in fear and doubt, when the unpleasantness arising from it is becoming insupportable, seek the surgeon's aid; in many cases, "as it may appear contrary" to the advice of their ordinary attendant, who counsels the do-nothing system, with the illusory hope that the unfortunate child will grow out of it. There is no possible condition of system in which the promotion or continuance of an otorrhœa is or can be desirable; it is a positive evidence of disease in the aural structure, either arising directly there, or in metastasis from other organs in a diseased condition.

Otorrhœa cannot exist without inflammation; the discharge is its product. The sooner the inflammation is subdued and its origin sought out and removed, the sooner the patient will regain health and strength, and the probabilities of permanently impaired hearing power be guarded against. The first care of the surgeon is to trace the effect to the cause, when by the removal of the exciting medium, its product will disappear. The ear forms no exception to this stereotyped rule of surgical practice, and when a patient with otorrhœa seeks advice, we must diligently look for the cause; we must not rest content that as it comes from the meatus externus, there the primary mischief lies.

In uterine discharges the obstetric physician satisfies himself whether the uterine organ itself or the vagina is the seat of disease, and in discharges from other structures the same care is taken in ascertaining the precise situation from whence the morbid product comes. But the ear is too often regarded as a subject beneath the surgeon's attention, and if the do-nothing advice is not tendered to the patient, a haphazard direction to syringe the meatus will frequently be the only prescription given.

Simple otorrhœa, arising from exposure to cold, will usually yield, if treated at its commencement, to a mild astringent injection. When occurring during the period of dentition, it is frequently found arising when the irritation caused by the tooth is at its highest, and subsiding as soon as it becomes emancipated, observing the same course until dentition is perfected. Such cases will require but little local interference beyond keeping the part scrupulously clean by the aid of simple warm water; but where this condition of the ear is manifest at this period, the natural secretions must be promoted by the administration of aperient and diuretic medicines. If otorrhœa should be profuse, or continue after the teething process is completed, in no instance must it be neglected with the hope, which is almost invariably not realised, of the child growing out of it; the general health must be as strictly attended to.

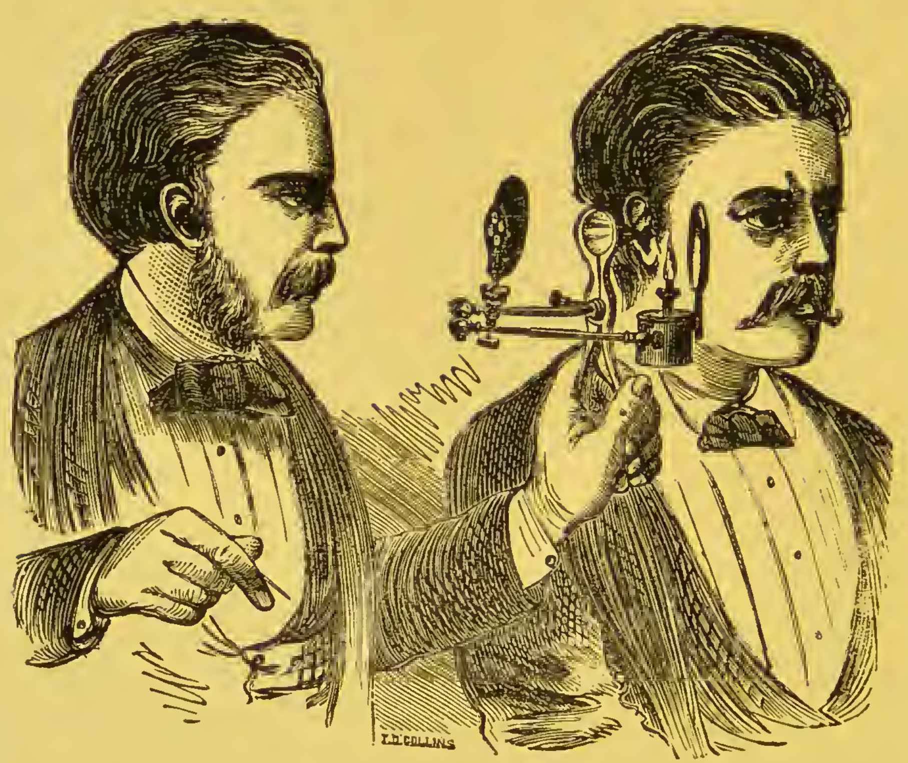
All these cases are much benefited by the preparations of iron, either the tincture or vinum ferri. The ear should be syringed out two or three times daily with a lotion composed of carbolic acid one drachm, glycerine one ounce, distilled water five ounces; and counter-irritation employed over the mastoid, for which I find the following formula very efficacious: Liquor epispasticus, one drachm; lin. saponis, one ounce; to be rubbed in at night. An addition to the lotion, of from ten to twenty grains of sulphate of zinc will frequently be beneficial. Should it be considered, as I am aware it sometimes is, that the ear discharge is a safety valve for preventing the development of cerebral or nervous disease, if the tendency to those affections cannot be removed or kept in abeyance by other means, and that such a derivative for the relief of the system is required, establish a drain elsewhere, more comfortable to the patient, less disgusting to his friends; and in the desire to avoid Scylla drift not into Charybdis, by allowing the continuation of otorrhœa to produce incurable disease in one of the most delicate structures of the human organism, impairing the efficiency if not entirely annihilating a sense so thoroughly essential to the wants and happiness of mankind.

In all discharges from the ear no opinion should ever be hazarded regarding it without previously making a thorough and complete examination of the meatus, membrana tympani, nasal passages, and throat. Inattention to this rule has been the means of throwing undeserved obloquy on this department of surgery, and consigning the sufferers from deafness and ear diseases into the hands of unscrupulous quacks and empirics. It must be remembered that otorrhœa is produced by a great variety of causes, the most frequent cause being an inflammation of the lining membrane of the canal from cold; but that it also occurs from dentition, exanthematic disease, gout, rheumatism, polypi, throat affections, foreign bodies, metastasis, injuries, periosteal inflammation, and skin affections.

FOREIGN BODIES.

Many different substances are introduced into the meatus externus, giving rise to more or less pain and inconvenience, and in the majority of instances creating very unnecessary alarm. Bits of slate pencil, small stones, beads, buttons, and pins, are those most frequently found there. When a patient comes with a complaint that some substance is in the ear, the first care of the surgeon should be to thoroughly satisfy himself that the patient's statement is correct, for it is a common occurrence for people to declare that some substance is either in their own ears or in their children's, of which an ocular and careful examination will prove the falsity; if the substance can be seen it is undoubted evidence, but the sense of touch is not always to be relied on. A case which lately occurred at King's College Hospital, under the care of Sir William Fergusson, so forcibly illustrates the soundness of this doctrine, that I give it as detailed in the *Lancet.* If the same caution were exercised by the general body of the profession, as this accomplished surgeon displayed, the very sad effects of what must be stigmatised as something worse than meddlesome interference in similar cases, would not be so frequent as they now unhappily are.

A child was placed upon the table who had been brought up from the country in order that a stone might be extracted from one of his ears. On introducing a probe, Sir. W. Fergusson found that it came against a hard substance, which he inclined to think was not a stone, but the bone adjoining the membrana tympani denuded of periosteum. He therefore



Combined Lamp and Speculum.

had an interview with the child's father, who assured him that a stone had beyond question been deliberately introduced into the child's ear. Sir William therefore returned into the theatre; but after again making careful use of the probe, decided to leave the ear alone. He said that the bone about the membrana tympani, which was exceedingly hard, had not unfrequently been mistaken for a stone, which persevering attempts were made to extract. A case similar to this one had come before him some time previously, and put him very much on his mettle, but he had decided not to interfere, and he was glad to know the patient had done well. With regard to the case before him, he was of opinion that if the object on which the probe impinged were a stone, it would yield a clearer click, and when manipulated would undergo some movement, however slight. The examination he had made left him satisfied that there was no stone in the ear, and he would rather that the patient should incur any risk that non-interference might be supposed to involve, than that he should undergo at his hands the danger of an attempted extraction.

All surgeons are not gifted with the *tactus eruditus* possessed by Sir William Fergusson, and, when ocular inspection can be so easily obtained, it seems unaccountable that it is so rarely employed; the combined lamp and dilator, which is figured in the plate, affords all the appliance necessary for this purpose.

It must be remembered that foreign bodies are introduced into the ear which will yield very much the same sensation that the contact of bone and the end of the probe conveys, and as the introduction of those substances generally occurs among children at play, the nature of the foreign body introduced may very naturally escape their observation. I have extracted a piece of cork from the ear, which the mother of the child assured me was a small pebble. If the account of the parent or child is taken for granted, and attempts at extraction are proceeded with and persevered in, the surgeon's endeavours may be crowned, not with the success anticipated, but by serious and even fatal results. The serious results of this unguarded proceeding have come with unusual frequency under my observation lately. It is almost as equally damaging to the reputation of the surgeon who has allowed his zeal to outrun his discretion, as it is unquestionably injurious to the welfare of the patient who has consulted him. When the presence of a foreign body in the meatus externus has been positively ascertained, the more gentle the measures used for its dislodgment, the more likely are they to be attended with success; a small stream of water injected against the side of the meatus, being, in the majority of instances, sufficient to effect this object, particularly if the introduction of the substance has been of recent occurrence, and no instrumental interference has been attempted. Should unsuccessful attempts to dislodge the substance have been made, the probabilities are there will be considerable tumefaction and extreme tenderness of the meatus. Under such conditions it will be more prudent for the surgeon to allow all inflammatory symptoms to subside before resuming any attempt at extraction, which is far more likely to injure his patient than the substance remaining in the canal.

In the majority of works on Aural Surgery cases are given where foreign bodies have remained for years in the meatus externus without causing the smallest inconvenience. Mr. Toynbee relates a case which came under his observation at St. Mary's Hospital, where a percussion cap had for fifteen years been lodged in the tube. Many such instances have occurred, and are authenticated by different authors, but one or two examples are sufficient for the purpose of illustration.

A short time since I was consulted by a young woman for otorrhœa of the left ear. After examining and prescribing for her, she requested me to look at the right ear, as two years previously she had put a white bone button into it. On examination the button was distinctly visible at the bottom of the canal close to the membrana tympani, and was washed out with the first charge of the syringe. In this case its contact with the probe would and did produce an almost similar feeling and sound to that which would be produced by touching the malleus with a metallic instrument; and foreign substances, by the irritation they excite, occasionally become glued to the lining of the meatus, requiring considerable manipulating to free their attachments. But the positive ocular evidence afforded by means of an ear speculum leaves no room for doubt as to the presence of a foreign body, and in no instance should this simple and infallible means of diagnosis be neglected.

When the inflammation caused by futile attempts at extraction is considerable, advantage will be derived by the application of two or more leeches at the external orifice, repeating them if necessary, and constant fomentations with a decoction of poppy heads.

The construction of the tube favours the ingress of any small substance. After it passes its outer third, it travels on, generally bedding itself at the posterior and inferior attachment of the membrane; and if the calibre of the canal is contracted by the swelling of its lining, until that condition is rectified its egress will be effectually prevented, and rude attempts to drag out the body will but increase and complicate the difficulty. Until the swelling has subsided, and space for the extraction of the substance is afforded, interference with it is both meddlesome and mischievous practice. Allusion is made by some authors to substances which swell from moisture, and the necessity which arises in consequence for their immediate extraction. Seeds, particularly those of the sweet and edible pea, are mentioned in this category. I cannot see any reason for a different plan of treatment. It no doubt is desirable that the meatus externus should be occupied only by its natural secretion. But, whatever the nature of the foreign body which may either by inadvertence or design gain access to it, the same gentle and cautious measures for its extraction must be employed. If it be a soft substance and visible through the speculum, a fine probe bent at the point, a cataract needle, or even a piece of fine wire looped, may either be pressed into the substance or passed behind it, so withdrawing it.

The case of Colonel Smith, detailed by Mr. Stephenson, is interesting from the severe nature of the injury. This gentleman consulted him for discharge from the ear, with considerable loss of hearing power. About two months previously, when out riding, his horse forced him among the branches of a tree, the concussion rendering him insensible. The auricle was much bruised and lacerated; a high degree of fever with delirium supervened, which subsided in a day or two after the escape of a quantity of pus from the meatus; subsequently there was little or no uneasiness felt except on pressure over the tragus, when deep-seated pain was experienced. Mr. Stephenson, on examining with the ear speculum, observed something projecting into the inner part of the meatus, which he extracted with some difficulty. It proved to be a splinter of oak which had penetrated anteriorly in an oblique direction, to the depth of two lines, close to the membrana tympani. Its removal afforded immediate relief, and hearing became perfectly restored. This case is instructive as well as interesting. The symptoms following the injury were all compatible with those which follow from direct violence applied to the side of the head, which had caused a rupture of the membrane of the drum. But what benefit could the patient have derived from treatment applicable to such an injury if the speculum had not revealed the true nature of the case, enabling the surgeon to afford prompt relief? This is a strong practical case in proof of the importance attaching to the use of this little instrument.

Insects find their way into the meatus, causing much uneasiness, and occasionally intense pain. In Wilde's "Aural Surgery," a case is related of a gentleman, who, while out shooting, suddenly threw himself on the grass, rolling in convulsive agony. The author dropped a little water into the ear, which dislodged a small hawthorn fly, giving instantaneous relief. The custom is, under such circumstances, to drop oil into the ear. This no doubt destroys the life of the intruder; but a small syringe with a little water will more speedily effect the object in view.

An occasional source of irritation is met with, caused by the small hairs growing at the orifice of the meatus becoming loosened, and voyaging inwards until they are arrested by the membrane of the drum, to which they closely adhere. In these cases, syringing would have the effect of pasting them more firmly. The membrane must be brought well into view under sun light, and a little glycerine dropped on to it. In half an hour afterwards each hair may be readily removed with a fine-bladed blunt forceps.

The application of a few drops of glycerine, before attempting to lift off the hairs from the membrane, will render it much easier of accomplishment, as the hairs become fastened with great tenacity to its cuticular covering, and the glycerine loosens their union. In performing this operation the head should be laid on a hard cushion placed on a table. In this position, with a delicate touch, the manipulations required may be performed without causing much pain to the patient. The intense sensibility of the membrane to any pressure must be borne in mind in all operations where an instrument must necessarily be brought into contact with it.

EXCESSIVE SECRETION OF WAX.

Any considerable accumulation of wax in the meatus externus is attended with more or less deafness. The excessive secretion of cerumen is caused by irritation of the ceruminous glands being excited, most generally from exposure to draughts of cold air. This condition is readily diagnosed by the speculum, and its removal, if properly performed, is an operation of great simplicity; but from both carelessness and ignorance in its performance, it not unfrequently happens that more mischief than benefit is the result. It is a common occurrence for patients to present themselves complaining of tinnitus and distressing vertigo, with the history that these symptoms had arisen since having their ears syringed; an operation which chemists seem to consider their peculiar province, but which the majority are totally incompetent to perform, for the cases are innumerable where syringing has been long and violently employed without a particle of wax being dislodged; the process being followed by increased deafness, and frequently by alarming vertigo. In some of these cases, affections of the tympanum, with an arrest of ceruminous secretion, which is certain to be found in disease of any standing occurring in the aural structures, has been the condition for which the syringing process has been most injudiciously employed.

It cannot be too well understood that a want of ceruminous secretion, usually an index of other disease existing in the aural structures, is a far more frequent cause of deafness than an overabundant amount of this substance.

When a plug of wax is by means of the speculum discovered blocking up the meatus externus, its removal must be undertaken by means of a proper syringe; if an ordinary one of sufficient power is used, its nozzle will effectually block the external opening, and the force of the pent-up fluid will drive the plug inwards, until arrested by the membrane of the drum, where its contact gives rise to the sensations before mentioned. Should the operation be still persevered in, forcible rupture of the membrana tympani may be caused.

Even in the hands of an adept, syringing the meatus not uncommonly produces partial, and, in some instances, complete, syncope.

The stream of water should always be directed against the walls of the canal, the object being that the return fluid should carry the substance with it. In some instances the secretion has so hardened, and attached itself by adhesive inflammation to the lining of the meatus, that all attempts to dislodge it with the syringe are unavailing. Few aurists of the present day would follow Pilcher's advice under such circumstances. He advises that syringing should be continued for half an hour every day until the substance is removed. I believe such prolonged treatment is mischievous. If the wax is not dislodged by, at furthest, a dozen charges of the instrument, all further attempts should be abandoned, and the patient directed to steam the ear two or three times daily, by holding the side affected over a jug of boiling water. A little glycerine should be dropped into the meatus at night, and some simple liniment rubbed around the region of the auricle. By persevering in these measures for two or three days, the plug will, in nineteen cases out of twenty, be discharged with the first syringe-full of water when again applied.

If other means prove insufficient for its removal, a fine probe should be passed round the mass, separating its adherence to the walls of the canal. As considerable abrasion of the cuticle lining the meatus will be observed after this operation, and exposure to cold may set up inflammation, it will be necessary to direct the patient to keep a little cotton wool in the concha, lightly covering the external orifice of the meatus; not stopping up the canal, which is the usual method. A weak astringent lotion should be applied to the abrased surface, and counter-irritation kept up for a few days behind the auricle.

In examining the ear for accumulated cerumen, care must be taken not to confound it with other conditions which are sometimes met with closely resembling hardened wax. Mr. Harvey details a case in which the syringe was used to dislodge what was supposed to be a plug of wax; this proved to be a coagulum of blood, which had closed up an aperture in the membrana tympani. The operation produced obstinate hæmorrhage from the tympanum, followed by an acute attack of inflammation, which extended to the pharynx, in the posterior part of which an abscess formed.

In some instances, where the membrane of the tympanum is perforated, a dry crust forms at the opening, which materially assists the hearing power. If this be diagnosed as wax—and it will require considerable care and attention to distinguish its true character—and syringing is employed, the crust will be removed, resulting in a certain diminution of hearing; and possibly, as in the case just mentioned, in obstinate hæmorrhage and inflammation. I have known several instances where, from the history the patients have given, these circumstances have, no doubt, occurred. The usual description given is :—The patient was always slightly deaf in one ear, dating from either an attack of scarlatina—which is the most common source of serious ear affections—or some other cause; thinking the hearing was getting worse, application was made to a chemist, who employed the universal panacea—the syringe; that a little black scale had been washed out, since which the hearing had become very much worse.

It will be seen, therefore, that this simple operation must be decided upon and performed with much greater care than is usually bestowed upon it, and should never be undertaken without a thorough examination of the canal. Patients frequently complain of a stunning noise in the ear after the removal of a plug of cerumen, but this always subsides in the course of a few hours. A piece of cotton wool should be worn at the orifice of the meatus for a day or so after the operation. Hardened wax produces a variety of very serious symptoms, such as distressing tinnitus, giddiness, confusion of ideas, &c., which will subside on its removal.

AFFECTIONS

OF THE MEMBRANA TYMPANI.

THE Membrane of the Tympanum is subject to a variety of affections. Inflammation arising in its own structure, or extending to it from the meatus externally, or from the cavity of the tympanum internally. It is perforated by ulceration, violence, and design. The term myringitis has been applied to inflammations affecting its intermediate fibrous layer which must be considered the true membrane; for though intimately connected with it, the external dermal covering is merely the termination of the lining of the external meatus, and can be readily removed by maceration, and its internal layer is an expansion of the mucous lining of the tympanum.

Though anatomists have considered these three layers as forming the membrane, its most important part is the middle layer, which has been considered by some writers, Sir E. Home among the number, to be not fibrous but muscular. Occasionally small abscesses form here, but it is an affection of rare occurrence. A healthy condition of the membrana tympani is of vital importance to the perfect sense of audition. Its position exposes it to atmospheric influence, and it is frequently the seat of inflammation which causes a thickening and opacity of its structure producing one of the commonest forms of deafness. The well-known fact that in many cases a considerable loss in the substance forming this membrane is attended with but slight diminution of hearing power, has led to a disregard of the important function it plays in the formation of sound, and a consequent carelessness in preserving it in that healthy condition which alone can enable it to efficiently perform its duties. As shown in the opening chapters of this work, it is the vibration of this membrane that sends the warning on by means of the ossicles.

Some writers on aural surgery give the bony parietes also as a medium of conduction, but I believe, except when in contact with the sonorous body, the idea is an erroneous one, and that the bony structures merely form the way by which the sonorous undulations are conveyed to the membrane of the drum, and in itself has no power of transmitting them. Thus, the conception of sound is regulated by the degree of vibratibility of which the membrane of the tympanum is capable, and therefore anything which interferes with its due vibratory power must necessarily prove a cause of deafness also. It must be remembered that sound is produced by the agitation of the fluid in the labyrinth acting on the filaments of the auditory nerve. How exquisitely sensitive these structures must be to convey the gentle undulations which an efficient organ is capable of receiving. That it is mechanical irritation of the nerve of audition which produces sound has been proved by Volta, who, on applying a galvanic current to himself, perceived that it produced a hissing sound in the ear. The commonest cause of loss of vibratory power in the membrane of the drum is an hypertrophy of its substance, and this is to be detected by the appearance which the membrane presents. In its natural state it has a light silvery appearance with a glistening point where the malleus is intimately connected with it, and in diseased conditions it presents a variety of aspects, varying from slight opacity to that of a shrivelled scale, which can only be attained by long standing disease; and when such a condition is arrived at, the chances of even alleviating the sufferer's deafness is very shadowy, but I believe not entirely hopeless, provided the patient has strength of mind sufficient, and the surgeon has the patience requisite to persevere, in the long and unremitting attention by which alone any beneficial result can be secured.

Whatever the original cause of the disease may have been, whether the membrane became implicated in the disease of other structures, or gave birth to it in its own, to its diseased condition may be attributed a large majority of cases of deafness; and every surgeon should render himself familiar with its normal appearance. It would be impossible to accurately describe the many changes from a perfectly healthy condition to that of absolute disease, which may be observed as occurring in the membrana tympani, it will be sufficient for all practical purposes to state that the tendency of all the affections to which it is liable is to cause a thickening of its walls. And what are the consequences resulting from this? In the first place, its sensibility is materially decreased; it does not so readily respond to the vital force of the sonorous waves, and consequently is unable to produce that degree of vibration in the ossicular chain consonant with these inceptive undulations. When present in a minimum degree, it constitutes a slight loss of hearing power, and in a superlative degree entire cophosis. The appearance which the membrane presents when hypertrophied, and the disease is not in an aggravated form, or of very long standing, will be fairly illustrated by stretching a piece of parchment over a ring and damping it.

It will be always found that a patient suffering in this way experiences a considerable accession of deafness in damp and foggy weather, which is due to the spongy condition which the membrane has assumed, rendering it incapable of sufficiently resisting atmospheric pressure, and consequently bulging in to the cavity of the tympanum, impeding the action of the ossicles and contracting the calibre of the drum.

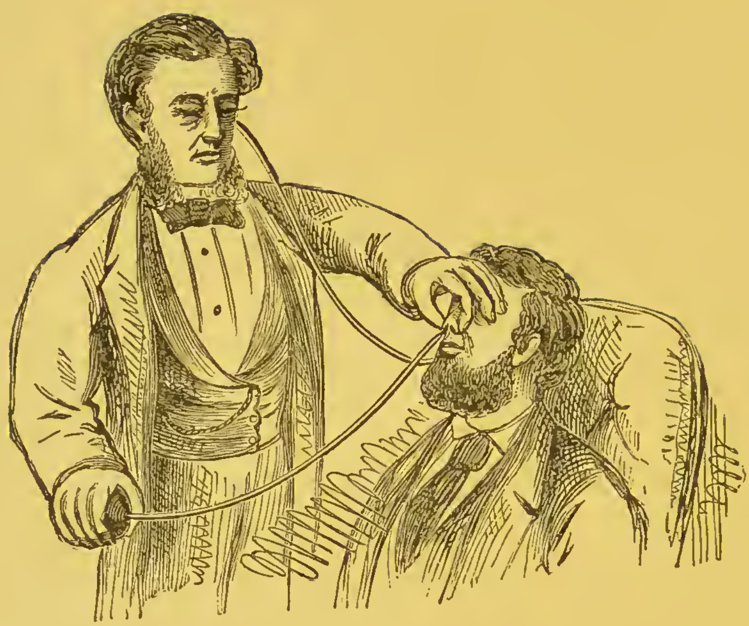
This morbid alteration has occurred chiefly in the fibrous texture or true membrane, diminishing the tonicity of its fibres. To remedy this condition I believe nothing exercises a beneficial influence so speedily as the application of nitrate of silver in stick, painting the whole membrane lightly over. It may be contended that this operation is both a painful and a difficult one. It no doubt requires both skill and gentleness; but if both these essentials are employed, I do not find that it produces more pain than applying it in solution with a brush.

When applying anything to the membrana tympani, the instrument used should be held very lightly between the index finger and thumb, taking care that the end not in use should project behind the back of the hand. By observing this precaution, should the patient move his head suddenly, the instrument will slip through the fingers, and thus avoid injuring the membrane, an accident which would be very likely to occur if the instrument be firmly held and the patient start while the surgeon is in the act of using it, a circumstance which is always to be apprehended.

Many cases of this thickened and collapsed condition of membrane occur where, from the formation of the meatus externus, it is with difficulty a view of it can be obtained, and where it would be almost impossible to follow this treatment. In such cases astringent lotions should be dropped into the meatus. By the patient holding the affected side upwards, and the surgeon dilating the cartilaginous portion of the canal with a Kramer's speculum, the solution may be dropped on to the external surface of the membrane. For this purpose I generally use a solution of five to ten grains of nitrate of silver to a drachm of rose water, and after allowing it to remain in contact with the membrane for a few seconds, dry out the meatus thoroughly with cotton wool. This proceeding must be repeated until the external surface of the membrane is blackened by the application, and, until the black scales have peeled off the process must not be repeated, though before the normal condition is restored, it may be necessary to repeatedly apply the solution. For this reason I prefer, when practicable to employ the solid stick, which will rarely require to be used more than two or three times. Care must be taken that inflammation is not excited; and, as a precautionary measure, I usually blister behind the auricle, for which I find the liquor epispasticus an excellent agent, When treating the membrane itself, the exciting cause of the disease must not be overlooked; and I am of opinion that the membrana tympani is much oftener implicated by affections of the tympanum extending from the throat, than it is affected by disease arising in its own structure, or in the meatus auditorius externus. All catarrhal affections of the air passages soon find their way through the Eustachian tubes to the drum; and the mucous irritation of the internal lining of the membrane soon disorganises the true or fibrous membrane, consequently, all our efforts to restore its tonic property would be baffled so long as the catarrhal affection is in existence, for which appropriate treatment must be employed.

In all catarrhal affections of the air passages, when the Eustachian tubes are affected, the requisite supply of air to the tympanum is impeded either by the congestion of its mucous lining, or by excessive and altered secretions. The patient should be directed to inflate the drum by closing the nostrils and mouth and forcibly expiring; or, if unable to do so, the drum should be inflated by the surgeon, either by means of a tube and mouth-piece or Politser's bag, which Mr. Allen has further improved upon. The very small quantity of air which the tympanum is capable of containing, is essentially necessary to sustain its membrane against external pressure, and the natural temperature of the cavity so quickly rarifies the air contained in it, that a constant supply of fresh elastic air becomes imperative, and its absence removes another obstacle to collapse of the membrane.

Acute inflammation of the membrana tympani, myringitis, may proceed from cold, or from its implication in the disease of adjacent structures, or from metastasis, but the commonest



Artificial Inflation, with Otoscope.

cause from which idiopathic myringitis arises is from exposure to draughts of cold air and wet. Transitions of temperature from a heated to a cold atmosphere frequently produce it.

Its onset is characterised by severe lancinating pain, sometimes implicating the whole side of the head, the patient not uncommonly complains of increased pain attending the movements of the jaw. On examination, the membrane will present a dusky red colour, and on careful investigation the minute vessels may be seen in a state of engorgement. This inflammation of the membrane so closely assimilates neuralgia in the character of the pain it produces; I believe it is very frequently attributed to that affection. Heated ball-rooms are prolific in its production, and my professional readers can no doubt call to mind instances where their services have been required by ladies, who complained of intense pain of a neuralgic character, attributed to exposure to cold air after several hours spent in the heated atmosphere of crowded rooms. It would be well when such symptoms present themselves to ascertain the condition of the membrana tympani. The pain produced by an inflammation of this structure is of an alternating character, usually much aggravated at night, and remitting at the approach of morning, when a thin discharge may be seen oozing from the meatus externus. The pain in these cases is invariably accompanied by a buzzing sound, similar, but more intense, to that which may be produced by placing a shell or other concave surface over the auricle. If taken in its early stage, a saline aperient should be administered, and moist heat constantly applied to the part, which may be done by holding the side of the head over the steam of hot water, to which may be added twenty-five drops of tincture of opium, or some other anodyne preparation. Syringing with warm water has been recommended, but the membrane when inflamed is so exquisitely sensitive to the slightest touch, that the pain produced by its use is oftentimes unbearable. If the discharge becomes so profuse as to render syringing imperative, great care should be taken not to direct the stream of water against the inflamed membrane, but against the roof of the canal; by doing so in a very gentle manner, the water will not penetrate as far as the diseased structure, and will effectually cleanse the meatus from any morbid secretion which may have accumulated. A weak solution of liquor plumbi, ten minims to a drachm of rose water, may with much advantage, be dropped into the meatus and allowed to trickle on to the membrane. This should be done two or three times daily. The orifice of the meatus should be protected by a little cotton wool placed in the concha, and in this, as in almost all affections of the aural structures, counter-irritation behind the auricle will be of much value in removing the sequel of the disease. The only certain method of diagnosing the pain which proceeds from inflammation of the membrane of the drum, from that called neuralgia, is by ocular inspection. Should the inflammatory affection resist the simpler method of treatment, more decided antiphlogistic measures must be adopted. Leeches, in number in accordance with the severity of the symptoms, must be applied as close to the external opening of the canal as possible. Free diaphoresis should be promoted by the use of the warm bath. Blistering fluid applied over the region of the mastoid, and extreme cases may require the heroic exhibition of mercury, as in severe inflammation of the membrane, the whole auditory apparatus becomes implicated in the disease and may produce meningitis. Active inflammation is not unfrequently caused by irritating fluids being dropped into the ear, and a sub-acute affection turned into active and dangerous disease by the employment of some one of the nostrums recommended by ignorant charlatans for the cure of ear affections.

Traumatic inflammation of the membrana tympani may arise either from forcible rupture of the membrane by some foreign body having been thrust into the meatus. From the concussion produced by the discharge of fire-arms. From violent inflation of the tympanum through the Eustachian tubes; or, from the wounds caused by the surgeon's knife for its perforation, which is, however, of very rare occurrence. The treatment of traumatic inflammation differs in no way to that laid down for the idiopathic form. A chronic inflammation of this membrane is commonly met with in strumous and delicate constitutions; the amendment of the general health must in such cases occupy a large share of the treatment. The ordinary result of an inflammation of the membrane is a DIMINUTION of auditory power, which is caused by a thickening of its fibrous layer, or from a loss of its substance from ulceration,—the description and treatment of this condition will be found in another chapter.

Inflammation of the tympanum, Acute Otitis, commences with the same symptoms previously described as characteristic of myringitis, but in a more aggravated form. It is a difficult matter to correctly ascertain, after inflammation has made any head in the aural structures, where the disease primarily sprang from. The whole organ of hearing is contained in such a small space, and all its constituent particles are so intimately connected and bound together, that the entire organ soon participates in the disease of a component part.

The onset of otitis is marked by acute lancinating pain, described as darting into the brain, usually accompanied with high exaltation of hearing power; in some cases so intense is this susceptibility that the slightest noise becomes intolerable, producing paroxysms of agony. The pain is aggravated by an attempt to masticate, or even to perform the act of deglutition. It is somewhat intermittent, but, unlike that in myringitis, never entirely subsides. The acute darting alternates with a dull throbbing pain, almost as unbearable. If the membrana tympani can be observed—for not only the canal but the auricle itself soon becomes involved in this disease—it will be seen to resemble a piece of liver in colour. And should the effusion of pus have occurred in the drum, which sometimes takes place at an early period, but is certain to occur sooner or later, the normally slight concavity which this membrane presents is changed into a decided convexity from the internal pressure of the fluid. No time should be lost in puncturing the membrane, as by its mechanical action the pus is adding to the mischief, and aggravating the patient's suffering. Its natural means of escape, the Eustachian tube, is blocked up at the outset of the attack, and it has no means of spontaneous exit except by the process of ulceration through the membrane, which should never be waited for. The early performance of the operation can have no hurtful tendency, and its beneficial influence may be incalculable, as not only will it free the cavity of the inflamed tympanum from the pressure of a foreign body, but will prepare a way for the ingress of medicated fluids, vapour, or otherwise, as may be considered most beneficial.

An attack of acute inflammation of the tympanum cannot be too heroically combated. The rapidity with which it extends its sphere of implication and its destructive, disorganising tendency, not only warrants, but imperatively demands, the use, and perseverance in the use, of all those antiphlogistic means which the modern surgeon is cognizant of for the subjugation of alarming inflammations, in which category acute otitis must take a prominent position. Here, that hesitation which the practitioner of the present day has to the abstraction of blood—a hesitation which I believe is, in many cases, carried far beyond the bounds of wisdom—must find no place. The local abstraction of blood by means of leeches is absolutely necessary, and according to the severity of the symptoms and the general physique of the patient, it must be decided whether general depletion ought not also to be employed. Small doses of mercury should be administered, and if the brain become affected, the patient should be got under the influence of the mineral as speedily as possible. Hot and cold fomentations have both been recommended, but when decided cerebral symptoms have manifested themselves, cold evaporating lotions or ice are to be preferred. It requires a certain power of discrimination to decide when the inflammation has extended to the brain. The mere presence of delirium, though indicating an excited condition of the sensorium, is not decisive of inflammatory action having extended to it. Such excitability may be caused by the intense pain of the otitis. In Wilde's "Aural Surgery," page 335, the author says :—"I have seen delirium, apparently more the result of suffering than any interference with the sensorium, too frequently attend inflammation of the membrana tympani and even the meatus, that I do not think it is itself a pathognomonic of sufficient importance to lead to the belief that the brain is affected; but incoherence, or much hesitation and irregularity of answering, or of understanding what is said, is generally characteristic of cerebral disease; so is great intolerance of light, contraction of the pupils, tossing of the head from side to side, and a feeling of weight as well as pain referred to the whole head." Vertigo is a symptom also deserving of attention. In addition to the general expression of pain, particularly during a paroxysm, there is constant low moaning, which is highly characteristic of cerebral complication.

With such symptoms present, the patient's life is trembling in the balance, and any hesitation on the surgeon's part in employing the most active treatment narrows the slender chance of a successful termination to the case. Depletion and mercury are the sheet anchors, and as the disease is, in by far the majority of cases, met with during the periods of youth and manhood, the reparative powers are in full vigour.

Of all the exanthem scarlatina is the disease which most frequently engages the auditory structures, and its *modus operandi* will be readily comprehended by calling to mind that the lining of the tympanum is continuous with that of the fauces, and the symptomatic affection of the throat soon travels through the Eustachian ducts and engages the investing mucous membrane of the drum. A very large proportion of the deaf cases which present themselves at the Royal Dispensary, particularly among children, are primarily and justly attributed to the ravages of scarlatinal disease. I am of opinion if greater care were paid to the ear symptoms, which so frequently occur during an attack of scarlatina, and that the possibility of these symptoms arising from otitis was more generally admitted than it has hitherto been the fashion to do, not only would a true solution of the complication be arrived at, and the means of speedy relief be in our power, but the consequent ear disease, not unfrequently ending in total and irremediable deafness, be entirely guarded against. As the characteristic of scarlatina disease is the throat affection, so the natural sequel to the throat affection is the extension of its disease to the tympanum; and when the result is so obvious, the hesitation with which medical men admit the possibility of the cerebral symptoms proceeding from otitis can only be attributed to ancient prejudice.

In Mr. Harvey's work, "The Ear in Health and Disease," page 101, a very interesting case is given. As it is peculiarly illustrative of the subject, I give it in detail. Three children were attacked with scarlatina; two of them did not come under the author's notice until some time after their convalescence, when he was consulted for the distressing deafness and otorrhœa which resulted from the disease. The membranes of both ears, in each case, were ruptured, and it would seem from the author's note that the disease resisted all treatment, the discharge never entirely subsiding. In the third case, Mr. Harvey saw the child during the attack, which was severe and attended with great pain in the head referred to the ear. The membrana tympani of both ears was punctured, affording immediate relief to the patient, and followed by the most satisfactory results; for in this case there was no subsequent ear affection, nor the slightest diminution of hearing power. In severe cases the inflammation soon engages the deeper structures, resulting in necrosis and exfoliation of the bony parietes. At the end of this work is a table of five hundred cases of deafness, taken seriatim as they presented themselves for advice. The frequency of scarlatina as a primary cause of this disease may be noted; of its accuracy I can testify, as each case came under my immediate notice. Otitis, in an aggravated form, may be produced from any cause affecting the mucous membrane of the air passages. Bronchitis is not unfrequently a promoter of it.

The following case came under my care some time since. I give the patient's own version :—" On the 10th of February, 1870, I took a first-class cabin passage per 'Cunard' steamer, from New York to Liverpool. On the voyage I caught a cold which resulted in an attack of bronchitis; two days after the doctor sweated me for this, my nostrils became stopped while endeavouring to clear them by snuffing violently, I felt a stream of cold air burst through my right ear; this gave me very severe pain, and in a short time the ear commenced to discharge. I was advised to apply cotton wool saturated with laudanum. This, however, did not relieve me. On reaching Liverpool I had to leave my berth and go on shore, during an easterly wind, on the deck of a tug-boat, which caused a return of the bronchitis, which kept me in bed for fourteen days. The pain in my ear increased, extending from the back of the neck to the top of the head, so that I could sleep but a few minutes at a time. I presented myself at the Royal Dispensary for Diseases of the Ear, and was operated upon. The acute pain left me in a short time, and I am thankful to state I am now quite recovered."

In this case, relapse of the bronchitis increased the already existing irritation in the drum, setting up acute otitis, engaging the lining of the mastoid cells. A condition which is indicated by the great increase in the pain, and the tense feeling in the side of the head which the patient complains of. This, with the external evidence, consisting of an inflammatory blush and more or less tumefaction over the region of the mastoid, affords unmistakeable evidence of this portion of the aural structure being implicated. The first and most important method of treatment, recommended by all writers on this subject, is a free and early incision, which, to be effectual, must be carried down to the bone. Fluctuation must not be waited for. Division of the deeper structure not only gives immediate relief, but most frequently arrests the further progress of the disease. Hot fomentations and warm poultices applied to the side of the head, with appropriate systemic treatment, must also be employed. By the use of these means the surgeon will, in most cases, have the gratification of seeing a very formidable affection speedily subdued. If allowed to run on, caries and necrosis of the mastoid, with all their attendant evils, will speedily result, and the possibility of even a fatal termination to the case must be borne in mind.

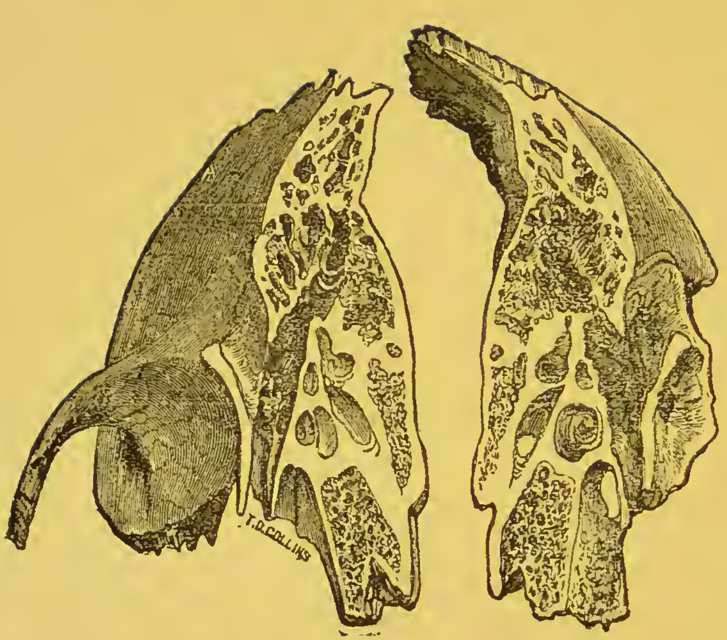
Some time since I had a patient under my care with a fungoid growth of somewhat malignant character, and decided caries of the mastoid. He had previously been an out-patient for over twelve months at one of the London hospitals. The growth was of an extremely hæmorrhagic character, and on my examining it at his first visit it bled profusely. The patient was suffering intense pain. By the constant application of wool soaked in a solution of carbolic acid the fungus gradually disappeared, the pain subsided, and the patient regained tolerable strength. Some time afterwards he caught a severe cold, and the mastoid disease awoke with renewed activity. I operated twice with no very favourable results. Being obliged to leave town for a few days, he came under the care of another aural surgeon. I understand the disease rapidly advanced, destroying the patient in a few weeks. I was unable to find out the exact history of the case after the patient passed from under my hands, but I believe the fungus was entirely destroyed, and the extension of the bone disease was the cause of the patient's death. I give the case as an instance of the fatal results which may accrue from this affection.

CATARRH OF THE TYMPANUM.

Catarrh of the tympanum is said to occur when its mucous lining is in a condition of sub-acute inflammation, producing increased secretion. It is the result of coryza, and is ushered in by a feeling of chilliness, followed by pyrexia, and a sense of fulness in the ears and head, stuffing of the nasal passages, and a buzzing sound in the ears, with a loss of acute hearing power. There is not actual deafness, but the sense is blunted. This condition is so plainly pathognomonic of an ordinary cold in the head, which perhaps every inhabitant of this country has individually realised, that beyond the unpleasant heaviness it induces it receives but little attention, and, as a rule, passes off without any treatment being employed. Occasionally, however, the increased mucus secretion set up in the tympanum becomes a cause of considerably impaired hearing, both from the impediment which it presents to the due vibration of the ossicles, the blocking up of the Eustachian ducts, preventing free access of air to the cavity of the drum, as well as barring the passage by which redundant tympanic secretion can alone normally find exit. The membrana tympani speedily partakes in the alteration of structure caused by this disease. On examination, its glistening appearance will either be entirely lost or much altered, and the manubrium of the malleus, so plainly visible on a healthy membrane, will be faintly, if at all, distinguishable. The faucial mucous lining will in these cases almost invariably present a congested appearance, and the lining of the nasal passages a bright red colour. There will be complete inability by the patient to inflate the drum by the ordinary method, or on doing so, either by forcible expiration with the nostrils and mouth closed, or if performed by the surgeon, on applying an ordinary stethoscope over the auricle, or the otoscope in general use, a gurgling sound, similar to that heard in the lungs, and described as mucus râle, will be plainly noticeable. The deafness and buzzing sensation in the head will be much aggravated in damp or foggy weather, and a corresponding improvement takes place when it is bright and dry. For this reason this affection is often allowed to degenerate into a chronic disease very difficult to cure, the patient trusting that every improvement will progress and become permanent, to find this hope dispelled when the atmosphere becomes humid—a condition, unfortunately, of too frequent occurrence in this country.

In the treatment of Aural Catarrh, I have found great benefit speedily produced by the preparations of potash, particularly the chlorate, administered both internally and snuffed up the nostrils in solution; ten-grain doses to be given thrice daily, and a scruple dissolved in an ounce of water, a teaspoonful of which is to be added to a tablespoonful of warm water, to be snuffed up the nasal passages in the morning and at bed-time. The therapeutic action of the drug will be at first to increase the secretion, which soon, however, subsides altogether, acting on what is erroneously called the homœopathic principle. *Similia similibus curantur*, a principle applied in surgery since the days of Galen; a gleam of truth, culled by the practitioners of this quackery for gulling the weak and credulous.

Catarrh may have subsided, leaving considerable diminu-



Section of Temporal Bone through the cavity of the Tympanum.

tion of hearing as its result. This may be confined to one, or it may engage both ears ; it is caused by the mucous secretion in the cavity of the drum, drying up and forming hard crusts, which interfere with the secreting power of the lining of this chamber, as well as with the action of its chain of bones: by referring to the plate in which the os ossicula are delineated *in situ*, it will be seen how small a deposit will materially interfere with their action. Heroic remedies are advocated by some aurists of the present day for the removal of this deposited matter—namely, by violent and repeated syringing. We are told, in a celebrated book on English Surgery, that a mass the size of two marbles has been dislodged by this process and removed from the cavity of the tympanum, which, in its fully developed state will barely admit of its containing a pea. If such effects follow the practice thus advocated, and produce what must be considered magical results—for withdrawing from a given space a mass of four times the bulk which, it is patent to all observers, that space is capable of containing, ranges within the domains of the magician—all honour must be given to those gentlemen who so successfully practise it ; but not having been an eyewitness of such a remarkable phenomenon, I am inclined to be sceptical. I advise a less energetic, and I cannot help feeling assured, a less hazardous mode of procedure. As the obstetrician's eye must be at the end of his index finger, so should the eye of the Aurist be at the extremity of the nozzle of his syringe to carefully note what he is doing ; and such violence as it would be necessary to employ for the forcible scouring out of the tympanum, to clear it of tenaciously adherent morbid depositions, is injudicious practice, and one that cannot be too strongly condemned. The good effect of this performance has been told to me, and when it failed in having a good effect, its harmlessness. But I have had many patients under my care where such violent measures would, I feel sure, have been attended with serious, if not fatal results. This mode of practice is by no means new ; it is one that had been in vogue many years ago, and was almost exploded.

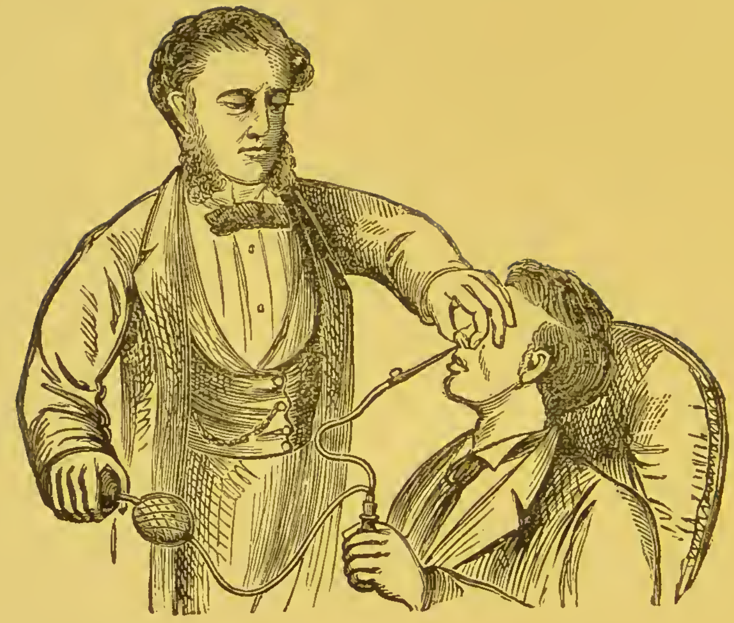
There are other methods besides the hydropult for attaining the object in view. The absorption of the deposition met with in the tympanum may be generally secured by the employment of mild solutions of potash, silver, and iodine preparations introduced through the Eustachian ducts ; or by fumigation, by means of one of the many ingenious instruments our continental brethren have adapted for this purpose, If the fluid be introduced directly into the chamber, the patient's head should be thrown back and inclined to the side to be operated on ; by retaining the instrument for some little time in the duct, the spasm which often greets its entrance will have subsided ; the solution, to three or four drops, should then be dropped into the hollow of the catheter and allowed to trickle down. When sufficient time has elapsed for the fluid to have traversed to the extremity of the instrument, withdraw the catheter and direct the patient to forcibly expire, closing the mouth and nostrils, by which action the fluid will be forced into the cavity of the tympanum. It may be necessary to continue this treatment for a considerable time, when, except in very extreme instances, or in advanced age, entire removal of the offending matter will be obtained.

In most cases when these depositions occur in the tympanum, the osseous portion of the Eustachian tube will be found similarly affected, and there will then arise the inability of the patient to inflate the drum, but by the direct application of the solutions through the catheter, the obstruction will soon give way.

This process in the bony canal may be much hastened by the introduction of fine strings of gut through the tube of the catheter ; care must be taken to first mark the length of the instrument on the gut, and then make successive marks an eighth of an inch asunder, by which it can be correctly ascertained how far beyond the point of the catheter the gut has penetrated. Kramer recommends that a few drops should be placed in the catheter and blown into the tube; but I consider the plan I propose is more certain in its operation. After this application has been several times repeated, a spray of warm water should be thrown into the posterior opening of the nares by means of a bent tube with a bulbous perforated end, armed at the other extremity with an elastic ball. The irritation and sneezing produced by this operation frequently dislodges considerable masses of secretion, which must not be supposed to come altogether from the Eustachian ducts, the greater portion being dislodged from the nasal canals. In Kramer's work on "Diseases of the Ear," he gives very minute instructions how to diagnose the condition of the tympanum, by the character of the sounds produced on artificially inflating the drum. But in Kramer's hands, extensive practice in this special department of surgery had rendered him an adept in the employment of this means of diagnosis; but it would probably be a less satisfactory guide to the general body of the profession, nor is it essential that such minute distinctions of sound should be recognised.

EUSTACHIAN OBSTRUCTION.

THERE is no difficulty in determining whether the Eustachian tubes are in their normal condition or blocked up. If no air enters the cavity of the drum on an attempt at forcible inflation, made either in the natural way by the patient himsslf, or artificially by the surgeon, there is positive evidence that the tube is impermeable. If the obstruction is caused by mucus accumulations of recent date, perseverance in the attempts at inflation will usually succeed, and the sound which will be conveyed through the otoscope is unmistakeable. If the obstruction is caused either by redundant mucus secretion which has dried up, layer over layer, no amount of blowing will dislodge it; nor, as in some instances, though of rare occurrence, if osseous deposition has taken place in the bony portion of the tube, a condition of parts which if once thoroughly established is irremediable, no amount of inflation can penetrate to the tympanum. The endeavour then must be to decide on the nature of the obstruction, and the previous history of the case will generally conduct to a correct conclusion. If the patient complains of having suffered for a prolonged period from stuffiness of the nasal passages, or of being very susceptible to cold in the head, deafness occurring during these attacks, and becoming permanent after a rather pro-



Eustachian Douche.

longed one, the inference will be that either the soft walls of the tube are agglutinated together, or that it is blocked from dried-up secretion. The Eustachian catheter will tell if the soft walls are in contact, as this instrument can be pushed up to the commencement of the osseous structure, and any adhesions which may exist in this situation are readily broken down. If the plug is situated in the bony canal, extending, as is most generally the case, from the interior of the tympanum, the catheter cannot reach it, but the impediment may be treated by passing a fine piece of gut through the instrument marking it in the manner directed in the last chapter.

EUSTACHIAN TUBES.

The Eustachian ducts opening into the tympanum form a very important portion of the hearing apparatus; through them a ready exit is provided for redundant tympanic secretion; they are also the channels through which air is supplied to the drum. It is by this air that the different membranes covering the apertures in the tympanum receive support. The effect of occlusion of these canals is seen in a morbid condition of the mucous lining of the tympanum and its membranes, with loss of their vibratory power and bulging-in of the structure, with consequent cophosis.

The Eustachian ducts, as described in the opening chapters of the work, are trumpet-shaped, the smaller or osseous portion, from half to three-quarters of an inch in length, opening into the cavity of the tympanum,—the cartilaginous and membranous, the largest part forming the faucial outlet. They are lined by the mucous membrane common to the throat, and in every instance become more or less implicated in the various affections of that region. It is therefore imperatively necessary that in all cases of ear affections the condition of the throat tissues should be ascertained. How futile would be the attempt to cure or alleviate a case of deafness by the common practice in vogue for all aural affections—namely, syringing the meatus and dropping in a little warm oil or glycerine, when the cause of the infirmity lay in a congested condition of the mucous lining of the ducts, which had extended from the throat.

It was and is still supposed that the Eustachian tubes were mediums by which the sonorous vibrations were conveyed to the tympanum; but this is an erroneous idea. Place a small watch on the tongue, being careful that it is isolated from all other contact, close the lips, and not a vibration will reach the ear, clearly showing that pulses of sound do not traverse these canals.

The origin of this idea was deduced from the position generally assumed by a person in the act of intense listening. The trunk will be observed to be thrown slightly forward, the head partially turned, and the mouth open. It was therefore assumed that sonorous vibrations entered the tympanum through the duct called by some writers the *iter a palato ad aurem*, and in France the aqueduct; but this idea is erroneous. In the act of acute listening breathing is entirely performed by the mouth, and for short periods the acts of inspiration and expiration are suspended. The consequence of this is, that after a full inspiration the drum is filled with air, and its egress is barred by the position of the velum, which is tight and horizontal, as all the air entering the lungs is coming through the open mouth; consequently, the membrana tympani, acted on by the pent-up air, becomes more rigid, the chain of ossicles in their turn become more tense and more capable of transmitting the almost exhausted oscillations to the fluid in the labyrinth.

Though the pulses of sound do not travel through these ducts, they perform an all-important office, inasmuch as it is through the Eustachian ducts alone that air can enter into the tympanic cavity; and I have before shown how essential a due supply of air is to the development of the sense, and how the obstruction to its entrance into this chamber will eventually end in complete loss of hearing.

Mr. Toynbee, in his work on "Aural Surgery" (page 192), has given an ingenious explanation in support of his theory of the Eustachian tubes remaining closed, and the cavity of the tympanum being a closed cavity except during the act of deglutition, basing his idea on the action of the tensor and levator palati muscles; but as both these muscles terminate by an expansion into the velum, which structure continually alters its position according as the acts of inspiration and expiration are performed through the nasal canals or through the mouth. In the latter instance the velum is horizontal, in the former it is vertical; consequently, every movement of this body influences the walls of the Eustachian ducts. But, independently of this fact, the very construction of the tube, composed as it is of bone, cartilage, and membrane, would negative the idea that at any time, except under morbid conditions, the walls of the duct are ever so approximated as to prevent the entrance and exit of air to and from the tympanum during every act of inspiration and expiration. The different methods given by Mr. Toynbee to practice, in support of his view, no doubt produce the results he describes; but it must be remembered that in these experiments we are exerting undue force, and though nature has provided us with such ready means for overcoming the temporary obstacles which so frequently occur in the Eustachian tubes, it is by no means a proof that this force is required for the mere admission of the air requisite for that cavity when the parts are in a normal condition, consequently they do not prove Mr. Toynbee's assertion.

FUNGUS.

As the different kinds of polypi are usually found external to the membrana tympani, so growths of a fungoid character are usually met with sprouting from the internal walls of the tympanum. I do not contend that polypi are never met with in the tympanic cavity, nor that fungus growths may not occur in the meatus externus, but that the several morbid products are generally confined to the regions assigned to them.

The distinguishing feature of growths of this character occurring in the aural structures is their hæmorrhagic nature, profuse bleeding frequently occurring at the slightest touch; if an attempt be made to remove the growth by the mode suggested for the removal of polypi, the mass will smash up, like an over-ripe raspberry, under the pressure of the instrument, and the hæmorrhage be profuse, and even in some instances alarming.

I prefer treating fungus by astringent and escharotic applications, and I have found much benefit in the use of pure carbolic acid; the growth should be very lightly touched two or three times a week. Care must be taken not to provoke bleeding, which is sure to occur if the slightest roughness is used. Between the applications of the acid the patient should be directed to keep a piece of cotton wool, soaked in a solution of it, in contact with the growth, changing it three or four times daily. Under this treatment I have had the satisfaction of seeing unhealthy and suspicious-looking tumours speedily assume a more benign character.

A. B., a thin, spare man, of about forty years of age, consulted me a short time since for an offensive discharge from the right meatus; he stated that he had seen a Surgeon, who told him he had a polypus, and recommended him to have it extracted. Being rather pressed for time on that morning, I omitted syringing the meatus to cleanse the passage from accumulated discharge; a proceeding which I consider should never be neglected. In this case not only did its non-observance give me considerable trouble, but the case occupied much longer time than it would have done had I cleansed the part and ascertained the true nature of the growth. On attempting to grasp it with the forceps it broke up, and smart bleeding, difficult to check, was the result. It turned out to be a fungus tumour springing from the cavity of the tympanum. By the constant application of carbolic acid, occasionally alternated with the tincture of perchloride of iron, it completely disappeared, and a fair amount of hearing power in that ear was regained.

In these cases it does not always follow that deafness accompanies the development of this morbid product, for I have had a case under my care where the hyperacusis was a prominent feature, though the meatus seemed entirely blocked up by the fungus, which was extremely irritable; the whole region of the temporal bone was very tender to the touch, and the integuments over the mastoid swollen and doughy. The patient stated that the substance had been several times partially removed, but that it grew faster and became more painful after each operation. Under the circumstances I thought that any direct interference would be more mischievous than salutary, and ordered strong tonic medicines. I believe this man subsequently was operated on, the integuments over the mastoid were divided, when a fungus mass burst out, showing the malignant character of the disease, which had gradually absorbed the bony wall, and was only kept from appearing externally by the integuments, which of course in their turn would have soon given way. Such a malignant form of the disease is fortunately of rare occurrence, but it must be borne in mind that it does sometimes occur. Some authors suppose that tumours of a benign character, if injudiciously tampered with, are apt to assume a malignant form, and for this reason object to the application of escharotics. But having used pure carbolic acid in a large number of these cases with good results, I can confidently recommend it. Care should be taken that the part is kept thoroughly cleansed by constant syringing, with either a weak solution of the acid, or a solution of permanganate of potash, in the proportion of five grains to an ounce of distilled water.

THE LABYRINTH.

THE internal ear, or labyrinth, would come next in order for consideration, but unfortunately the changes that take place in that structure—the most important part of the organ of hearing—are only familiar to us as *post-mortem* appearances. It is beyond the reach of the surgeon's art to remedy any defect occurring there, whether congenital or otherwise. It has been not uncommonly the seat of fracture, either from transmitted violence, as in a person falling from a height and alighting in a sitting posture, causing fracture of the base of the skull, or from direct force. It is said that blood flowing from the meatus after an accident of this kind, though indicating the serious nature of the injury, is not a fatal symptom, but that a welling-up of serous fluid is usually followed by death. An interesting case occurred in the practice of the late Sir Philip Crampton:—A young lady suffered from urgent symptoms of inflammation of the brain, with paralysis of the face and leg, and total deafness of one ear. She recovered from the head symptoms and paralysis of the extremities after the occurrence of a copious discharge of pus from the meatus. The discharge and facial paralysis continued, accompanied by occasional attacks of pain in the ear. Sir Philip Crampton perceived some loose bone lying in the meatus, which, on extraction, proved to be the entire internal ear, cochlea vestibule, and semicircular canals complete, with a small portion of the wall of the tympanum. The patient made a good recovery. Such a result could hardly have been looked for. Pathological research has shown that many changes take place in the internal ear, and among the scientific men who have closely investigated the subject, none deserve higher commendation than the late Mr. Toynbee, whose numerous preparations are of the greatest interest. It is, however, to be regretted that from the position and complex nature of the structure composing the internal ear or labyrinth, but slight practical value has resulted. It is easy, with a little care, to recognise morbid conditions in any portion of the aural structures in *post-mortem* examinations, but as a correct account of the symptoms consequent on these conditions can rarely if ever be obtained, the lesson which it would be otherwise capable of imparting is more than half lost. As the study of this branch of surgery is gradually becoming more general, and in several of the large hospitals special departments for the treatment of ear diseases are provided, the extended opportunities for observation thus afforded will no doubt be utilised, and many points which are now mere matters of conjecture will more clearly be demonstrated.

DIAGNOSIS OF DEAFNESS.

To ascertain that a patient is deaf is undoubtedly a very simple proceeding, but it is by no means so easy a matter to correctly diagnose the cause and character of the deafness. Such a knowledge is only to be gained after the proper tests have been applied and careful investigation made. There are many varieties and degrees of hearing power, as there are many varieties and degrees of seeing power. In affections of the eye, these varieties and degrees have each their correct designation—such as Nyctalopia, Hemeralopia, Presbyopia, Myopia, and so on, each signifying an abnormal affection of the organ of vision, which would be wrongly described by the single word blindness, yet any defect in the hearing power is simply termed deafness. Though as yet unprepared to classify the different varieties of hearing power, which are quite as numerous as those occurring in the sense of vision, and are as misnamed under the general term deafness, as all affections of the organs of sight would be under that of the word blindness, I hope, at no very distant time, to be able to more correctly designate the variations which are met with between the perfect and complete enjoyment of the sense of hearing and that condition which is correctly denoted by the single word *deafness.*

On a patient presenting himself, complaining of any loss of hearing, not only should careful inspection of the external meatus and membrana tympani be made, but the throat and nasal passages should also be examined. In a large proportion of the cases which come under notice, it will be found that in these situations the origin of the affection is to be met with. As the mucous membrane of these passages is constantly exposed to the catarrhal affections so common to this climate, so in the majority of such cases the disease extends to the lining of the middle ear. It would be hopeless here to expect any success in treatment if such treatment be confined to the ear; but with the use of astringent and stimulating gargles and lotions, by which the faucial lining and Schneiderian membrane is restored to a healthy condition, a benign influence will be exerted on the lining membrane of the Eustachian tubes and tympanic cavities. The appropriate treatment in such cases will be more fully considered in other chapters.

After the examination of the fauces and nostrils, the external meatus should be viewed, as the deafness may be accounted for by a condition of the parts there recognisable.

The external auditory canal, instead of presenting its normal tubular formation, may have become a mere slit, due either to the collapse of its cartilaginous part, or to exostosis, or a polypus may be seen blocking up the meatus. In several instances I have found this the case, where the patient was entirely ignorant that anything unusual was to be seen there; and were it not for the increasing deafness would not have heeded the slight otorrhœa accompanying the disease. The lining of the meatus and the condition of the membrana tympani must then engage our attention, and a perfect familiarity with the healthy and morbid conditions of this membrane is essential to all who undertake the treatment of aural affections. When possible, the examination should be made by sun-light, and for the mere purpose of ascertaining the condition of this membrane, I know no instrument better adapted than that of Brunton's. If sunlight cannot be obtained, then the rays of a lamp or candle may be substituted; but it must be remembered that such artificial illumination gives a peculiar hue to the membrane, which is not noticeable under sun or bright day-light, and allowances must, therefore, be made for it.

When the membrane of the tympanum is in a healthy condition it has, as before stated, a silvery appearance, and the outer surface is somewhat concave, and pointed inwards where the malleus is embedded in its folds.

When inspecting the membrane, the condition of the lining of the meatus should be observed, and particular attention should be paid to the state of the ceruminous glands, for with very rare exceptions the functions of these little bodies are entirely suspended in diseased conditions of the ear. After this ocular inspection of the different structures, a vitiated condition in any part of which will account for the patient's infirmity. A further test may be advantageously employed by placing a watch in contact with the bones of the cranium in different situations. For this purpose some persons prefer tuning forks, the vibrations of which are, no doubt, many times more varied than the ordinary double tick of a watch. I confess I look upon the application of this instrument as a rather mountebank performance. Every medical man carries a watch, but I presume few go about with tuning forks in their pockets; and for the purpose in view, the tick of a watch and its simple double sound is as efficient a test as the vibrations of a tuning fork. Though microscopical anatomy has revealed, and is still revealing, how perfect a musical instrument is contained in the internal ear, we are far short of being in a position to judge what causes may affect the efficient working of these aural chords described by Corti. If, on applying the watch over the auricle and in contact with it, the vibrations are not distinguished it might be thought an evidence of complete cophosis, and yet the same person may hold a conversation with you in but a slightly raised tone of voice, so that not being able to hear the tick of a watch is only an evidence that the particular machinery by which this tone is conveyed to the auditory nerve is out of gear; and so with other vibrations.

I had a patient under my care a short time ago who came to have his ears syringed for ceruminous accumulation. After the operation was over he distinctly heard every word I uttered in a low voice at the other end of a moderately-sized room; but, unless the watch was pressed very tightly against the auricle, not a single vibration of it was audible to him. This gentleman told me he had been unable to hear his watch for several years, and also when listening to the piano failed to catch several notes, though others struck with the same power were distinctly heard. The diagnostic value to be derived from placing a watch over the auricle where it is unheard—but on placing it over the mastoid process angle of the jaw, or squamous portion of the temporal bone, the tick is distinct—is, that it proves the impediment to the due transmission of the vibrations exists either in the membrane or in the chain of bones connecting the membrana tympani with the membrane covering the fenestra ovalis; in either case the mechanism which conveys the pulses of sound by which the fluids in the labyrinth are agitated and the nerve of audition thereby stimulated into action is at fault, and the results equal in effect. But the chain of bones, or one of the number, forming the ossicular chain may be affected, and the membrane present a perfectly healthy and normal condition; but in no case can the membrana tympani be materially affected without the normal position of the ossicles, and their capacity for transmitting the vibrations imparted to the malleus, becoming much diminished, and in some extreme instances entirely destroyed.

If the membrane is in fault the speculum at once reveals it, and the treatment must be applied to it; but if the membrane is healthy and the tick of the watch does not penetrate to the nerve when it is placed over the entrance of the external meatus auditorius, but is audible to the patient when brought into contact with the cranium in one of the other situations mentioned, the inference will be, that in some manner the chain of ossicles is crippled in its functions. This may occur from a variety of causes, and unfortunately, some of them can only be conjectured, as it is entirely impossible to correctly ascertain, except by actually seeing it, that a fracture has occurred in the handle of the malleus. Cases are recorded where this has been visible. One is detailed by Dr. John Roosa, in his translation of Troltsch's work. This was caused by a fall of fifteen feet, the fragments were discerned grating against each other; the fracture having occurred just below the short process. I consider this a very exceptional case, and one that might not again occur in the practice of any aurist for a century. No doubt the malleus may be fractured by violence, either of the kind above mentioned, or, as this bone is liable to the diseases which attack the osseous structures of the rest of the body, its composition may be so altered that unduly powerful vibrations, such as the discharge of a gun close to the ear, a cannon shot, or loud blast of a musical instrument may have the same effect, and I think it very likely such is the case. We hear not unfrequently of complete deafness coming on immediately after a patient has been subjected to one or other of the above.

Some of these cases yield to treatment, but others baffle all skill, and in such, when possible, it would be advisable to perforate the membrane and gradually enlarge the opening by introducing daily a fine point of nitrate of silver, until a view of the interior of the tympanic cavity can be obtained, when it may possibly become practicable to correctly diagnose the nature of the injury; this proceeding would undoubtedly be attended with great difficulty, and in many cases, from the formation of the external meatus, would be quite impossible, but we not uncommonly meet with patients where the tympanic cavity is plainly visible through an aperture in the membrane. I have at present under my care a man with an unusually large meatus—by turning the side of his head to the light, and pulling the auricle forwards, the membrane is easily seen, or rather its remains, for it is extensively eroded. With the speculum the chain of ossicles and cavity of the tympanum are plainly visible. A portion of the malleus is bare, but its upper part is adherent to the remnant of the membrane, and the hearing power of the ear is not much diminished. The patient consulted me for the pain he suffered in his ear on the slightest exposure. He was afraid to put cotton wool in the ear, but at my recommendation did so. He called upon me after a long voyage, stating that he never went without some wool, and was now quite free from any inconvenience.

If a case of deafness arising from exposure to violent sound waves, with a configuration of the external parts, similar to the above description, should occur, an opportunity for deciding a very interesting question and one of considerable practical importance would present :—namely, whether deafness, which admits of no alleviation from treatment, and which has arisen immediately after the ear has been subjected to the action of excessive aerial undulations, occurs from injury to the nerve of audition, or, as I am inclined to think more frequently, from fracture of the malleus, or from a disconnection occurring in the ossicular chain. It will be seen in either case that not only must cophosis follow, but the ordinary treatment which is applied to the nerve where the mischief is presumed to lay, must necessarily be ineffective. There are other morbid conditions occurring in the chain of ossicles which also affect the hearing power, adhesive bands may so connect them as either to diminish their vibratory power, or to entirely prevent it.

In the first case the deafness is less than in the second, but in neither is it complete, and in both remediable ; it will be observable that in damp weather, in a foggy and humid atmosphere, such cases hear better. This is due to an increased mucous secretion, which softens the adherent bands as well as the lining of the tympanic cavity, and allows freer play to the connecting chain. In some of these cases, and under such conditions, violent blowing of the nose has so inflated the tympanum, and forcibly bulged outwards its membrane, that these bands of dried secretion have suddenly given way, and the sufferer, to his or her great delight, regained complete hearing. A correct diagnosis of deafness occurring from this cause may be much assisted by noting the previous history of the case. It will be found the patient was very subject to coryza, with an irritable condition of the faucial lining. After a rather severe attack, deafness increased, and has been gradually getting worse, particularly in bright and dry weather. When the atmosphere is moist the hearing power is improved.

The point of junction between the malleus and the membrane of the tympanum will be observed to be puckered inwards, the adhesive bands may connect the bone or bones with the anterior, inferior, or lateral sides of the chamber, so that beyond this characteristic puckered appearance, there is no particular displacement observable. Or, again, the malleus and incus may be so bound together as to materially interfere with their functions; in this condition we also find a puckering of the membrane, which will be more distinctly observable by noticing the effect of inflation on the tympanum. If the watch be applied to an organ affected in this manner, the tick will be audible in an equal, or perhaps in a slightly less degree, than when applied over the bony parietes. The power which the ossicular chain possesses from the peculiar manner in which each link or bone is articulated with its fellows, in multiplying the vibrations communicated to the external surface of the tympanic membrane, and concentrating them on that of the fenestra ovalis, is restricted, and they become about equal with the bones of the skull in their power, as a medium of conduction for the external vibrations to the labyrinthian fluid. By the adhesions glueing them to each other, or to the walls of the tympanum, they have lost that specific faculty without the full enjoyment or power of which acute hearing is impossible.

In cases where the ossicles are pronounced to be in fault, I am presuming that the membrane of the tympanum, excepting the slight peculiarity I have mentioned, has been ascertained to be normal, and the Eustachian tubes patent, otherwise such a diagnosis will most probably be incorrect. The ossicles are bound together by ligaments and muscles, which attachments, though keeping the bones in apposition, allow them freely to vibrate. Rheumatic and gouty affections occur in and around these bones, as well as in their osseous structures, and interfere with their efficient working.

Again, anchylosis of the base of stapes to the fenestra ovalis takes place, and such a condition materially diminishes the hearing power of that ear. In such instances the tick of a watch will be more plainly distinguished when applied behind the ear than when it is placed over the auricle; low sounds will be with difficulty recognised, but with a raised voice the patient, except in extreme cases and other complications existing, will be able to distinguish what is said.

Where anchylosis of the base of the stapes occurs, and where the nerve is not affected, the deafness is caused by the loss of power in the mechanism which conveys the aerial undulations of sound in sufficient strength to agitate the contents of the labyrinth, and thus stimulate the nervous filaments into action. The base of this little bone, though entirely blocking up the fenestra ovalis, has no bony connection to it, but is intimately attached to the membrane which covers the opening, and thus, when the different parts are healthy and are in the act of receiving the sonorous vibrations impinging on the membrane of the drum, the tremulous motion acts upon this membrane in accordance with the force of the inceptive vibrations, and according to its vibration so is the amount of agitation produced in the labyrinth, and a proportionate stimulus applied to the nerve of audition. It will be readily seen, therefore, that as this membrane becomes immovable when the stapes is adherent to the opening, a great loss of hearing power must result, though not necessarily complete deafness. As the external membrane is still healthy it acts on the chain of ossicles which conveys a certain sensation, though in a very minor degree, than where the condition of each bone comprising the chain is normal.

It will require a close and thorough examination, well weighing every point in the case, before an opinion as to the cause of a patient's deafness can be safely given, and without such careful examination being made, cases of deafness can only be empirically treated.

How futile and, in numerous instances, how pernicious must be the use of these so-called specifics for the cure of deafness, *tinnitus aurium*, and other aural affections, which flood the advertising columns of the daily papers, when the causes of the infirmity are so multifarious and the appropriate treatment correspondingly diversified. But each one of these nostrums—galvanism included—is vouched for as a certain remedy for all forms and phases of aural disease. A moment's thought would prevent any moderately sensible being from attaching any credence to these announcements, but, unfortunately, that moment's thought is not often given, and the sufferer, wanting in that rare attribute, common sense, believes in these specious falsehoods, and falls a victim to charlatanism. The time when the disease could be successfully grappled with is not only spent, but sadly misspent, and if skilled treatment is afterwards sought and proves unavailing, another melancholy example is added to the victims of quackery, and, what is of more importance, another case is added to the list which sceptics of the value of treatment in ear affections seize hold of in support of their erroneous opinions.

Deafness usually arises from diseases existing in the ear, and the various forms of disease there met with are as amenable to treatment as morbid affections occurring in other parts of the human organism.

The points, then, to which our attention must be directed in looking for the causes of deafness, are, in the first instance, the external and visible portions of the auditory apparatus, then the parts which are connected with it—namely, the throat and nasal passages and Eustachian tubes, and, lastly, by means of a watch or tuning-fork and a careful consideration of the general condition of the patient, we may hope to arrive at a correct diagnosis of the cause of the disease. Unlike the organ of vision, where the disease is most commonly to be seen, and therefore cannot fail to be appropriately treated, in the organ of hearing a majority of its morbid affections must be diagnosed by inference based on obscure symptoms ; and many of these cases require much and careful consideration before a correct conclusion as to what the cause of the cophosis is attributable to, and where the mischief lies from which it arises. I have dwelt rather largely on this subject from the importance which I attach to it, and the mischievous consequences which so frequently come under my observation —the effect of hurried and careless opinions, or from ignorant and unskilled advice.

PERFORATION
OF THE MEMBRANA TYMPANI.

PERFORATION of the membrana tympani is usually easy of detection, though sometimes it may be difficult to recognise it with the speculum or otoscope, but by inflating the tympanum, either by the efforts of the patient or artificially, the whistling sound produced is positive evidence of the occurrence. Perforation of this membrane occurs from a variety of causes. A box on the ear not unfrequently produces it, and this ready and favourite mode of punishment for refractory juveniles in some instances is the cause of lasting injury, and should therefore be abandoned. Violent blowing of the nose, when the membrane is either weak or diseased, will burst its coats.

Here is a point which it would be well to remember, for there is an almost universal desire, when cleansing the nasal passages, to produce a trumpet sound, and many attain to great perfection in the accomplishment; but when heralding to all within a considerable radius the fact that the handkerchief is in use, the trumpeter not only runs chance of rupturing this important membrane, but the more noise produced in the operation the less effectually it is performed. When violent expiratory action is made, with the mouth closed and the nostrils pinched together and plugged by the folds of a handkerchief, a great deal of noise is produced, the thin light mucus secretion is first blown out, but that which is drier, larger, and more tenacious is not unfrequently sent flying into the pharyngeal opening of the Eustachian tubes. After blowing the nose violently in this way when suffering from cold in the head, the hearing becomes dulled, and a singing noise in the ears begins. This is caused by the mucus secretion, instead of being discharged into the handkerchief, being forced into the tubes, and thus blocking the air passages to the middle ear or tympanum, so that two evils may arise from the practice of nasal melodies,—one temporary, but very inconvenient, the other more lasting and serious. In cleansing the nostrils, the handkerchief should never be forcibly pressed against the openings, nor the thumb and index finger used as compressors; the act is performed much more effectually and decently by holding the handkerchief loosely to the nose and blowing. One tithe of the force will act with more efficiency than that required by the usual method, and any chance of thus rupturing the membrane of the tympanum be avoided.

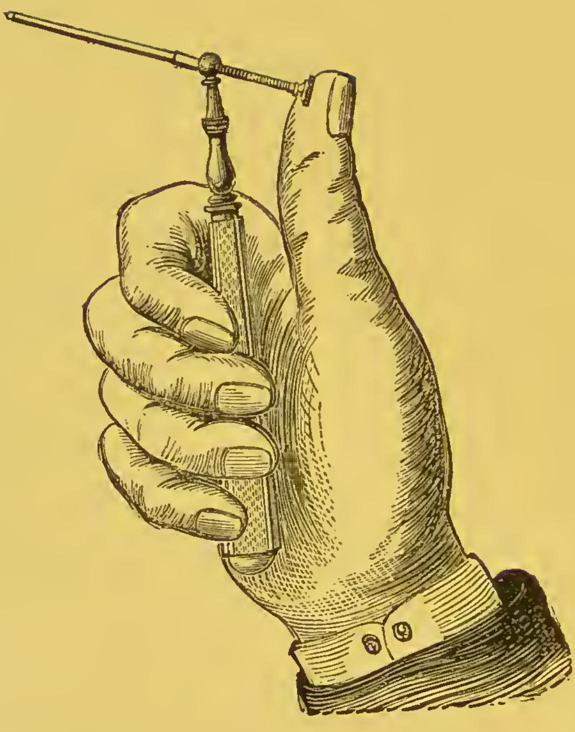
It might be thought that directions how to blow one's nose are hardly requisite in the nineteenth century, and that in a work on Aural Surgery it would be misplaced; but from many cases which have come under my care, where sharp pain in the ear, followed in a few hours by discharge from the meatus, after violently blowing the nose, which on examination proved to have caused a rupture of the membrane, is the best plea that the subject is one which requires attention even in this enlightened age, and as the baneful effect is generally experienced in the ear, its consideration in these pages is appropriate. I happened to be in company with a gentleman whose very loud trumpet attracted my attention, and I observed him holding his handkerchief to his nose for some time afterwards. On enquiry I found this gentleman suffered from constant epistaxis, though not to an alarming extent. On examining the nostrils, the Schneiderian membrane appeared red and congested. I advised him to snuff up a little salt and water twice a day, and blow his nose as seldom as possible, and then in the manner I have mentioned. I had many opportunities of seeing him afterwards. He assured me bleeding had never recurred; he had only used the solution of salt for a fortnight, but was most careful to follow up the rest of my advice.

A perforation of the membrana tympani may be attended with but slightly diminished hearing, or, on the contrary, complete deafness.

The degree in which the sense is affected is regulated by the position and size of the opening. If that part of the membrane which embraces the malleus sloughs away, the consequences are serious, as the vibrations may cease to be conveyed to the labyrinth, in consequence of the disconnection of this bone from its relation to the membrane, the ossicular chain falling to the floor of the tympanum, or its partial disconnection will impede the action of the chain of bones in proportion to the amount and position of the injury. A great deal has both been said and written concerning perforations of this membrane, and it has been contended that considerable openings in the membrane may exist without any ill result, and cases are recited where the patient was not aware of anything being the matter with the ear, where considerable perforation of the membrane existed, the opposite ear being the one for which the aurist was consulted. But there can be no doubt that a positive defect in the sense of hearing of that ear existed, though in an inappreciable degree. It is impossible that any morbid condition of the membrana tympani can exist without a deterioration of the hearing power coexisting also, though, as I before said, the patient may not be aware of it until perhaps he finds a difficulty in realising some particular distinction of harmonic vibrations, or until the other ear becomes affected, its failure to perform double duty leads to the discovery.

It is a curious, but very common fact, that a serious diminution of hearing power may exist in one ear and the sufferer be quite unaware of its grave extent, until the other ear becoming suddenly attacked, the defect becomes fully known.

Perforation of the membrana tympani takes place from



Perforator.

ulceration of its coats, usually occurring in cases of scarlatina, where the throat symptoms have been unusually severe, but such a result should never be waited for — an opening in the membrane, as soon as fluid is diagnosed in the tympanic cavity, should be at once made. For this purpose I have devised an instrument which I consider superior to any hitherto in use. The different perforators employed by aurists have unguarded sharp points, and when a case of scarlatina requires such an operation, in the first place the patient is usually very young, and there is great difficulty in getting him to remain steady;—secondly, the lining of the external auditory canal is morbidly sensitive; — and, thirdly, the patient has to be taken up and kept in a constrained position, in some cases, for a considerable time before the puncture can be successfully accomplished.

With the aid of the combined lamp and dilator, and the instrument delineated in the accompanying plate, the child requires to have the head only slightly raised, when the instrument can be readily inserted, its highly polished and rounded silver sheath easily gliding into the canal. When close to the membrane, a slight pressure of the thumb at the back of the instrument propels forward the cutting-blade, penetrating to the cavity of the tympanum with a sound somewhat similar to that which is elicited by forcing a pin through a piece of tissue paper. As the sharp point is entirely concealed by holding the handle loosely, an opportune moment, when the head is perfectly steady, may be waited for without any fear of the patient suddenly moving and driving the point to a hazardous distance through the membrane, which in all the other perforators I have seen and used, is a circumstance of not only possible, but probable occurrence. The fact of fluid being effused into the cavity of the tympanum to any extent, is characterised by the symptoms of cerebral pressure; and the membrane, on examination, will be perceived bulging outwards into the meatus auditorius. In all diseases where the throat is implicated, on the accession of any brain symptoms, the ear demands immediate attention;

and, if this condition of membrane be observed, on an opening for the escape of tympanic secretion being made, the brain complication will rapidly subside. There need be but little fear of any untoward result if this operation is carefully performed, and the puncture speedily heals; indeed, so lively is the reparative power of this membrane that it becomes a strong argument against the operation for the treatment of deafness; it being almost impossible to keep the aperture from closing, necessitating its repeated performance. And, as unquestionably, the membrane cannot be as effective after any operation upon it as when perfectly normal, repeated operations must necessarily considerably cripple its action.

Sir A. Cooper was the first surgeon in this country who punctured the membrana tympani, and the case was a complete success, the cause of the deafness being an obstruction in the Eustachian tubes. He was considered to have discovered a panacea for this infirmity, and the Gold Medal of the Royal Society was awarded to him. Consequently there was a general onslaught made on the membrane of the drum where the slightest cophosis existed. It came to be regarded rather as an impediment to hearing than as a most important part of the aural structure, but the result of the operation was so generally unsatisfactory, that this distinguished surgeon completely abandoned it, and for years before his death declined to perform it. I myself have given it a fair trial, and have rarely found it of the slightest use. In some few instances temporary benefit was derived, but as soon as the patient ceased to attend, the membrane healed up, and the deafness became as bad as ever. Bonnafont performed it many hundred times, and states in not one single instance with permanent benefit to his patient. In obliteration of the Eustachian canals, either from osseous deposition, or from what also may occur, enlargement of the carotid canal pressing on the cartilaginous portion of the tube, and so constricting it that air cannot permeate, artificial perforation of the membrane is advisable, and in such cases there is less difficulty in keeping the aperture open, due probably to the air pressure being altogether external. But such affections as these just mentioned are of rare occurrence, attended with very great difficulty of diagnosis during the patient's lifetime, and therefore their existence should not be too readily assumed. Should it be decided to perforate the membrane, besides the perforator figured in the plate, a variety of instruments have been used and recommended by different surgeons, from a simple knife with a double-pointed cutting edge, to the elaborate and ingenious instrument of Fabrizzi, which, like that used by Deleau and Bonnafont, punches out a piece of the membrane. The opening thus made is supposed to take a longer time to heal up, but this is questionable. In describing the operation as a simple one, the observation only applies when undertaken by an educated surgeon who is fully cognizant of the delicate nature of the structure he is dealing with, and brings his experience and judgment to bear in executing it. If rashly or ignorantly performed, serious and even fatal results may occur. The chorda tympani nerve, in its passage across the tympanic cavity, may be wounded, producing serious symptoms. The other contents of the tympanum may also be irreparably injured.

Cases are recorded where the operation has been followed by the death of the patient. Two such were brought before the Surgical Society of Ireland, the details of which will be found in the *Dublin Medical Press*, of April 1st, 1846. In one of these cases the operation was followed by a considerable increase of auditory power, supplemented, however, by fatal inflammation and death in six weeks. The other case was that of a young woman who had been deaf for some years, the result of a severe cold. A piece of the membrane was drilled out, violent inflammation ensued, the brain became engaged, ending in the patient's death. These results are no doubt unusual, but it is well to remember that they do occur, so that, simple as the operation may appear, it should be neither lightly undertaken nor carelessly performed. The healing process may be retarded by the constant application of a fine caustic point to the edges of the incision. Some surgeons adopt the practice of syringing the tympanum, through an artificial opening made in the membrane, for the dislodgement of mucus collections in the Eustachian tubes ; such a proceeding was advised and practised by Itard, but he acknowledges that the distressing vertigo and other unpleasant symptoms produced by the operation permitted of his very rarely practising it.

Taking into consideration the calibre of the Eustachian ducts, when covered with their soft parts, and the situation of the tympana Eustachian openings, one can readily see the grave objections to the proceeding, and the almost impossibility of attaining the results claimed for it. I believe, as more attention is paid to the treatment of aural diseases, this practice will share the fate of that advocated by Riolan, and practised by Jagger and Hagstroem, who perforated the mastoid process for the purpose of injecting fluids through the *iter a palato ad aurem.* Before any of these proceedings are adopted, the surgeon should carefully examine the bony parietes entering into the composition of the aural structure, when the difficulties in connection with their performance will not fail to strike him. Perforations of the membrane, produced by a blow or box on the side of the head, or from violently blowing the nose, usually heal rapidly, requiring little if any treatment. The injury may, however, be succeeded by otitis, in which case it must be combated by the mode of treatment recommended for that affection. Perforations occurring, either from an ulcer situated in the folds of the membrane itself, or where its structures give way from the pressure of pent-up fluid in the cavity of the tympanum, are, on the contrary, most difficult to heal, the loss of substance from sloughing being so great that all attempts to stimulate reproduction of the membrane are often vain.

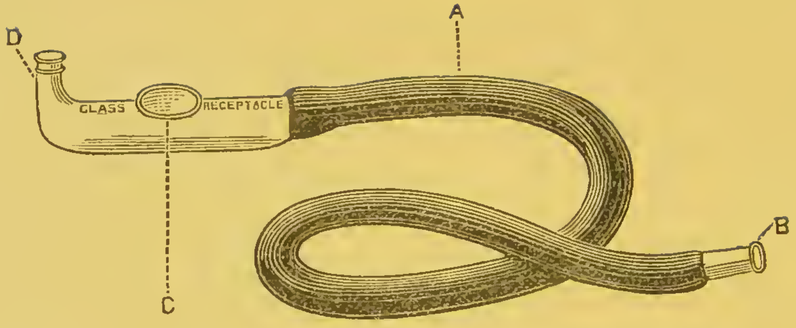
I have tried the application of the actual cautery to the thick and rounded edges of the opening with good results ;

its application should never be attempted without the aid of strong sunlight, and if such be available, with a Kramer's speculum and a piece of thin wire the operation may be readily accomplished. The edges of the opening should be lightly touched, taking care that the wire does not come in contact, either in inserting or withdrawing it, with the lining of the meatus. If the membrana tympani be inspected the day following the application of the cautery, the opening will be observed to be considerably enlarged, but if the tympanic cavity is in a healthy condition, with no discharge from it, healing process is soon set up, and the perforation, if not eventually entirely closed, will be much contracted from its original dimensions.

Where the application of the actual cautery is feasible, its action is more immediately beneficial, its effect more controllable, and its ultimate results more satisfactory than the application of any escharotic. While any active disease exists in the cavity of the tympanum, generating discharge, any attempt to heal a perforation in the membrane would be futile; the removal of the existing disease in that chamber will not unfrequently be followed by spontaneous healing of the opening; but if this fails to occur, and the edges of the perforation assume that rounded, callous appearance characteristic of old sores, until these edges are vivified no reparative action will take place. Where an opening in the membrane exists, causing deafness—and that, more or less, deafness must inevitably be a consequence of such condition is beyond dispute—and from one cause or another it be undesirable to attempt any remedial means, the practice now generally adopted is to block the opening by a piece of wet cotton wool.

The profession are indebted to the late Mr. Yearsley for this remedy; he learned its value from one of his own patients, but to him is due the credit of its general adaptation in aural surgery. Mr. Yearsley recommended that the cotton wool, being previously moistened, should be placed in contact with the membrane, but should not entirely cover the opening. There is a difficulty in applying so thin a layer in this situation, particularly when the wool is moistened. I have found it easier to pass the cotton dry up to the opening, carefully covering the whole of it, and then dropping some liquid on to it. Instead of plain water, a lotion composed of liquor plumbi ten drops, glycerine one drachm, distilled water half-an-ounce, should be used. With this application the cotton remains moist longer than with plain water. The patient soon learns to apply the remedy himself. The cotton should be extracted at night and a fresh piece used every morning. A small forcep, with long thin blades, is all that is required to apply it.

The late Mr. Toynbee used a piece of vulcanised Indian-rubber, placed between two thin plates of silver, with a small wire handle of sufficient length to allow of the Indian-rubber being adjusted to the opening, and withdrawn at pleasure. I have found the application of cotton wool more satisfactory in improving the hearing power, and where the patient is not unusually stupid or awkward there is little difficulty in its self-application. In children, if such a remedy be used, Toynbee's artificial tympanum is preferable. But in these cases the opening in the membrane would probably contract and close, were it not for the discharge exuding from the tympanum, usually the sequel of scarlatina. The endeavour should be made not to palliate, but to cure the disease, which, as a rule, can be accomplished. The syringe should be used two or three times daily with great gentleness, and when the patient complains of giddiness or pain produced by its use, both of frequent occurrence, it will be better to drop the lotion into the meatus, laying the patient on the side and letting it remain in for a minute, repeating the application several times. In a day or two the syringing can generally be resumed without its producing any great discomfort. When the discharge is very offensive in its character, the carbolic acid lotion, combined with sul-



Instrument for self-use for blowing pulverised substances or small quantities of fluid into either the ears or nose.

A. Thin elastic tube.

B. Glass mouth-piece.

C. Orifice, which must be covered with the top of the index finger after the substance is placed in the receptacle.

D. Point to be placed where the contents is to be applied.

phate of zinc, will soon alter it, when a lotion composed of solution of permanganate of potash two drachms, distilled water six ounces, may, with advantage, be substituted. This, combined with the internal administration of some ferruginous preparation in combination with iodine, steadily persevered in, will generally remove the affection in the tympanum, when the perforation in the membrane will rapidly close up. In some cases the discharge continues, having assumed a serous character, when a rather strong solution of alum, or a pinch of it finely powdered and blown through a tube into the canal daily, will, in many such cases, complete the cure.

CATARRHAL
AFFECTIONS OF THROAT AND EAR.

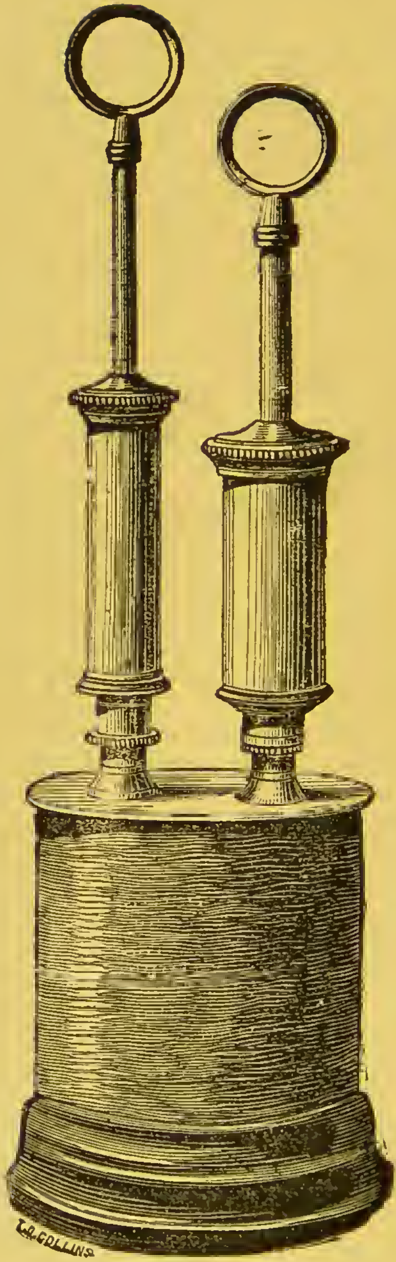
The word Catarrh has become a favourite term in our professional nomenclature; it is an expressive word and sounds well, but I believe is very frequently misapplied, if any importance is to be attached to its proper signification, which means, "I flow." It was formerly restricted to irritation of the mucous lining of the throat and nostrils, when these organs literally did flow; but it is now used as expressive of disease in all parts of the body. The term is not unfrequently applied as denoting a condition of the tympanic cavity totally opposite to its true character, namely, where there is an arrest of mucous secretion. Kramer considers this under the heading of Suppressed Exudation.

True catarrh of the tympanum is, I believe, an affection never originating in the cavity of the tympanum, but, like the opposite condition, suppressed exudation, extends to that chamber through the faucial openings of the Eustachian ducts, probably increasing there in its severity from the more delicate composition of its mucous lining; but, unlike suppressed exudation, where the tympanum partakes in the healthy action recurring in the lining of the throat and nasal passages, in catarrh these passages may have regained their normal condition, leaving a legacy of disease in activity in the interior of the drum. The affection invariably causes a considerable amount of deafness, and is frequently attended with a certain stiffness about the articulation of the lower jaw on masticating, in some cases amounting to pain. It usually affects both ears, but the patient will generally complain of the noise which is an ordinary accompaniment of catarrh, and impaired hearing power being much greater in one ear than in the other. The deafness in these cases arises from a three-fold cause—the osseous parts of the Eustachian ducts are filled with secretion, barring the entrance of air; the functions of the chain of the ossicles are impeded, and the membrana tympani is more or less affected, so that the whole gear by which the sonorous vibrations are communicated to the nerve are deteriorated in their efficiency; the degree of deafness being in proportion to the düration of the disease, not to the amount of the exudation, which may be so profuse in the early stage as to bulge outwards the membrane, causing a sense of fulness, with a loud buzzing sound, and yet but slightly diminishing the hearing. This is accounted for by the increased tenseness of the membrane and consequent stretching of the ossicular chain from the effused fluid.

When deafness is complained of during a catarrh of the ear passages, the exact cause of the affection is more readily comprehended, but this disease, existing in the tympanum after the outward and visible signs have passed away, and the mucous membrane of the fauces and nasal canals have resumed their normal appearance and function, is not so readily diagnosed. To do so correctly we must ascertain the positive and objective symptoms attending it. The positive symptoms are deafness, and the sounds elicited through the otoscope by inflating the tympanum; the chief objective symptom, is the influence exerted on the hearing power atmospherically.

In chronic catarrh of the tympanum, in bright dry weather, there is manifest improvement in the hearing, and a corresponding decrease when the atmosphere is humid. This is due more to the effect exerted by these conditions on the membrana tympani than on the interior of the tympanum. In a damp climate the membrane of the drum affected by catarrh becomes still more spongy, the middle fibrous coat has lost its tonicity, and consequently yields to the external force exerted upon it, bulging into the cavity; in dry weather it partially regains its healthy character by the loss of moisture—in this respect much resembling a piece of sea-weed, a simple and true indicator of the prevailing atmospheric condition. This constant recurrence from a semi-healthy to a diseased state eventually so disorganises the membrane that it collapses into the tympanic cavity, resulting in complete deafness.

On examining such a case the malleus will be perceived standing out in relief, with the membrane shrivelled away from it; in some of these cases the membrane has become so thinned by pressure on the head of the malleus that it has the appearance of being perforated by it, and it probably has perforated both the internal mucous and the middle fibrous layer, and is only covered by the external cuticular wall. At the first blush, when disease to such an extent exists, any remedial measures seem hopeless, but such cases do admit of alleviation, if not complete cure. The first object is to soften the dried membrane; this preliminary step in the curative treatment will occupy weeks, and unless thoroughly done all subsequent operations are useless. A little glycerine should be dropped into the meatus every second morning for three or four weeks, when the ear should be steamed twice daily; this may be effected by a very simple apparatus, consisting of a tin vessel with a tightly-fitting cover, perforated in the centre, and having attached to it a small tube, to the end of which is fixed a shell-shaped piece of vulcanite, which is placed over the auricle. After half filling the vessel with boiling water, the temperature may be kept up by placing a small spirit lamp under it, but if the water is boiling when put into the receiver this will not be requisite, five minutes at a time



Pneumatic Pump.

being sufficient for the process. This will have to be persevered in until the malleus does not seem to project so prominently; when gentle attempts should be made to draw the membrane outwards. This may be done by the instrument used as a breast exhauster, or it can be more effectually accomplished by the pneumatic pump figured in the plate, which was made for me by Messrs. Khrone and Sesseman, of Duke Street, by whom all my instruments are made. This pump has a double arrangement, by which the air can either be exhausted or forced in. The patient should be seated in an arm chair, with the head resting; the Indian-rubber pad should be wetted, as it adheres more closely to the surface; by pulling the short piston backwards and forwards, the air will soon become exhausted; this will be denoted by the increased difficulty of working the piston. The instrument should then be slowly and cautiously worked, desisting as soon as the patient complains of pain, or the force pump may then be applied, when it will be necessary to press the barrel more firmly. By alternately exhausting the air and forcibly compressing it the membrane is acted upon, and, when properly prepared beforehand, I have attained most gratifying results with the aid of the pneumatic pump, which I have great pleasure in now introducing to the profession.

Artificial inflation of the tympanum, through the Eustachian tubes, should be daily practised, taking care that no undue violence is used, or a rupture of the membrane is certain to take place. A short time since, in a case in which I was much interested, this accident occurred; the patient under the treatment laid down, was progressing most favourably; I was in the habit frequently of blowing air into the tympanum through the Eustachian catheter—for in these cases Politzer's mode of inflation should never be attempted—my patient had read some book in which this method is detailed, and, with an elastic enema apparatus, he forced a blast of air, while in the act of swallowing, into the nostrils. This was followed immediately by severe pain and slight bleeding. On examining the ear on the following morning there was a large jagged perforation of the membrane, which resisted all my attempts to heal up. However, from total deafness in that ear, partial hearing was regained, which contented the patient, and he returned to America much pleased. Had it not been for his injudicious self-treatment, in all probability a complete cure would have been effected.

There are, of course, many cases of this nature where all attempts to restore the membrane to a healthy condition fail; but no matter how unpromising the appearance may be, I think it hard, without a trial, to condemn a fellow-creature to groan under an infirmity, oblivion from which is only to be had during sleep; embittering what would be, in all other respects, as happy a life as falls to human lot.

Though the surgeon may gain credit for candour who boldly states there is no cure, the man who leaves no means untried, guarding himself against giving too hopeful an opinion as to the issue, is deserving of far greater credit; and the majority of cases, if not admitting of cure, are not past ameliorating. None, except those who have suffered from the loss of this sense, can realize the happiness accompanying its restoration. A deaf person is in the world, and yet only partially of it. Though the blind are objects of pity, I believe, of the two senses, that one, the exercise of which affords the largest share of human enjoyment, is the sense of hearing. Mozart was blind, but he has left that behind him which, as long as the world lasts, will make him to be ever remembered and ever honoured. Had Mozart been deaf and not blind, what a loss to posterity had been sustained. In all cases of catarrhal disease occurring in the middle ear, the air passages must be closely examined, and, even if presenting a fairly healthy appearance, must participate in the treatment. In early life affections of the throat, extending to the auditory structures, are of frequent occurrence. Among adults they are more commonly met with in females. In cases of deafness, where the throat affection is still in existence, there is a peculiar tone of voice by which the cause of the deafness may be correctly diagnosed even before the patient is examined. I am not alluding to any of those diseases specifically occurring in the throat, such as diphtheria, scarlatina, quinsy, &c., but to that congested condition of the mucous lining of the respiratory passages, combined with an irritation and enlargement of the pharyngeal glands, which are very numerous around the orifice of the posterior nares, two of a larger size than their fellows, being situated at the margin of the Eustachian ducts. The Schneiderian membrane is always affected in these cases, and in children, among whom the disease most extensively prevails, the margin of the nostrils is inflamed and excoriated.

No cause of deafness is more insidious in its approaches, more common or more certain in its ultimate effect than this condition of throat; and, to range to the superlative degree, of all affections it is that most neglected, particularly amongst the poorer classes. The general history in these cases is, that the child had gradually got listless and inattentive; that reproof and punishment were alike ineffectual; so, to see if anything was really the matter, the child is at last brought for examination. In many instances the consequences of the affection are attributed to obstinacy, and the little sufferer is cuffed and bullied—the disease is allowed to progress, and complete deafness results—a living monument of the parents' or guardian's culpable neglect, who rob the future life of the being, then dependent upon their care and judgment, of half the capacity for enjoyment; and, if the sufferer be a boy, dependent on his own exertions for success in the battle of life, all his chances of advancement are shipwrecked, and his infirmity is an ever-enduring source of bitter mortification.

In its earlier stages the membrana tympani presents but slight alteration from its normal condition, beyond a rather dulled appearance; but in none of these cases will there be the slightest trace of cerumen. This secretion, except in congenital deafness, when it is often redundant, is, in all ear affections, early suspended. I use the word suspended, for, accompanying the returning power of the sense, the ceruminous glands resume their functions, and their doing so is a most satisfactory sign of recurring healthy condition in the aural structures. This affection of the throat, fortunately, is most amenable to treatment. Tincture of the perchloride of iron, according to the age of the patient, should be given for several weeks, until the constitution is thoroughly renovated, and the pale, flabby look—which is almost a characteristic—has given place to a healthier aspect. If the child is old enough to gargle, one composed of biborate of soda and honey should be used thrice daily. When the surface has lost its congested appearance, a gargle of tannin, alum, decoction of oak bark, or some other astringent, should be substituted. Great advantage will be derived by sponging the throat, chest, and ,upper extremities, night and morning, with cold salt-water; and if the weather is favourable, a change to the sea-side, with or without bathing, will expedite the cure. In many cases it will be more judicious to commence the salt water baths in the house, and as the child gathers strength, open-air bathing may be substituted. Before immersing the head, the entrance to the meatus should be guarded by a little cotton wool; much benefit will also be derived by snuffing up a weak solution of common salt once or twice daily,—this will stimulate the Schneiderian membrane to a healthy action; and, further, the child should be made to blow the nose frequently, so as to keep the nasal ducts free from mucus.

A relaxed condition of throat will soon act upon the aural structures; and here, again, a prominent symptom and an unerring guide to the origin of the cophosis is to be found in the voice, in some instances amounting to aphonia. On examination, the fauces present a pale, flabby appearance, participated in by the chordæ vocales and thyro-arytænoid muscles. This condition of throat is the result of anæmia, and is more frequently met with among the female sex. It is not uncommonly combined with hysteria. Aphonia is due to the condition of the recurrents supplying the thyro-arytænoid muscles as well as the branches of the superior laryngeal, which act on these muscles, the nerves languishing for want of proper nutriment. The treatment consists in the internal administration of iron, bark, or the mineral acids, out-door exercise, and attention to all those hygienic rules calculated to restore the general system to a healthy tone. In some instances the loss of voice continues; but one application of a Stöhrer's battery will not unfrequently immediately restore it, to the astonishment of the patient and friends, who naturally regard this as magical. The use of the compound infusion of armoracia radix as a gargle, three or four times daily, is also of much benefit. As the bodily health improves and the blood contains the nutritive qualities necessary for sustaining the different organs of the body in their healthy efficiency, so the deafness will pass away also, unless treatment has altogether been applied to the ear with the idea that, as the patient is deaf, so, necessarily, in the ear must lie all the cause of the deafness. In the ear, no doubt, it does lie; but local treatment alone will have about the same result as would be produced by an engineer unscrewing the wheel nuts of an engine which has come to a standstill from the fire getting low,—as soon as the fire is lit his engine works, but he has to remedy the defect of his own creation, or lasting mischief may accrue.

Deafness is an affection too often maltreated, locally, when it is dependent on constitutional causes, of which it is but the effect.

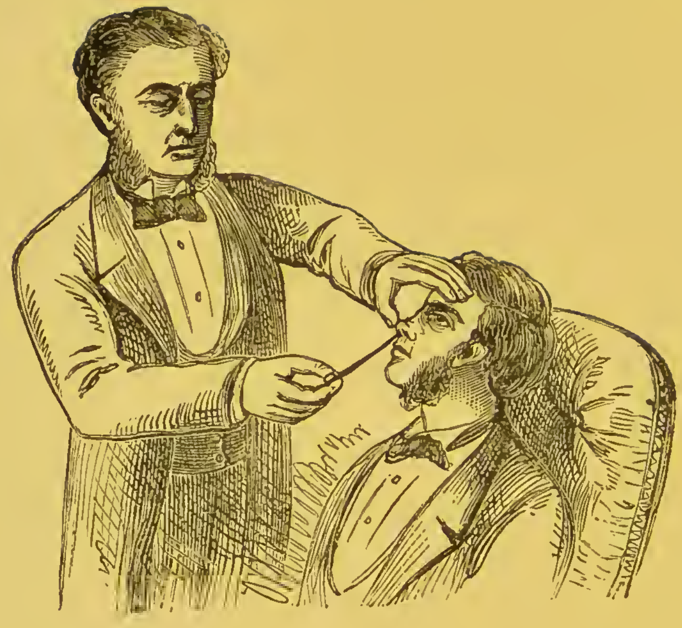
Another form of throat affection which is commonly met with is an arrest of the natural mucus secretion. On inflating the tympanum, a sound, somewhat resembling that which is produced by blowing into a small thin paper bag, is heard. I have never seen a true case of this description in the male. It is not uncommon to meet with a patient who complains of a dryness of throat, particularly in the morning,—indeed, among habitual and excessive smokers this is very common; but an almost entire arrest of secretion I have only observed among women. Here, again, systematic treatment, with hydrochloric acid gargle, must be relied on for the removal of the deafness complained of.

I am not undertaking to give a history of throat diseases, but mention a few of those prominent affections which always affect the hearing power. Kramer, in his work on the ear, states that forty per cent. of the deaf cases in this country arise from catarrhal affections, followed by interstitial exudation in the Eustachian tube and middle ear. He attributes it to the custom of washing the head in cold water, and to general bathing, without first plugging the ears with wool; and as a cause of arrested secretion, he attributes our large consumption of animal food. But I think in both these hypotheses he is mistaken. I believe nothing is more conducive to the general health than the habit of sponging the body over with cold water on rising, and, if more generally practised, the catarrhal affections, so prevalent in this country from the variableness of our climate, would not be nearly so frequent; and the fact of our carnivorous diet causing this arrest of secretion is a presumption which can hardly be supported, as Englishmen, though considerable consumers of animal food, do not live entirely upon it, nor consume it in sufficient quantities to arrest a healthy secretion from the mucous surfaces. Another of the causes to which Kramer attributes our numerous cases of this form of deafness, is the over-ventilation of our living rooms, he adds, even at night. And in this I must again join issue with him. We suffer more from neglect of proper appliances for ventilation than of excess of it. The discomfort which numbers of Londoners endure during dinner, with several flaming gas-lights over their heads, consuming the air they require as fast, or faster, than the viands on the table are consumed by them, until the oppressiveness becomes almost insupportable, and a draught of cold air is hailed as the greatest of blessings, is familiar to us all; whereas, if proper means of ventilation were fitted to every house, not only would it largely conduce to comfort, but would save many from the catarrhs caught in the overheated and badly-ventilated, or rather non-ventilated, rooms of our great metropolis. Thorough ventilation in the sleeping apartment is equally essential to health, and the more air circulating about, the less liable we are to those affections inseparable to an ever-varying temperature; and to this cause —not those given by Kramer—must be attributed those affections of the mucous surfaces of the aural structures which do not originate there, but creep into them from the respiratory tract, where they are first developed. In forty out of every fifty cases of deafness it is through the Eustachian tube that the ear becomes implicated, and it is by the same road that remedies must be applied with any prospect of success.

In treatment, the structure and size of these tubes must be borne in mind if it be determined to apply direct remedies to the tympanic cavity. Firstly, their condition must be ascertained as to whether they are blocked or open, which is to be accomplished by the means already described. A great deal has been said about dilating the Eustachian ducts, but the bony canal does not admit of dilatation, and its extremely small calibre renders it difficult of access to any instrument, and prohibits the employment of any violence, though Bonnafont, a French writer of considerable repute, advocates the forcible dilatation, or rather splitting up, of the mucous membrane, when the constriction occurs below the bony structure of the tube. Now, in the first place, there is extreme difficulty in deciding that a constriction of the Eustachian tube is situated in its cartilaginous structure, unless it be almost at the nasal orifice, which I have never met with, except in a case of extensive syphilitic ulceration, when the nose and palate had been eaten away by the disease; the measurements on a fine string of catgut, as a means of diagnosis, are easier to describe than to employ, and though a general estimate of the dilatable and non-dilatable extent of the tube has been settled by anatomists, there is no rule without an exception, and by relying on these measurements, we may fall into grievous error.

An abnormal, and rather an unusual condition of parts may exist, and when forcing the instrument through a canal, which we conclude is or ought to be of a given length, the temporary obstacle may be overcome, and the instrument penetrate to the tympanic cavity; doubling on itself, it may then do such mischief as man's art will prove entirely incapable of remedying. There is no part of the human organism that requires the operator to be gifted with a more sensitive touch, or requires more tender manipulation than the ear, and in all treatment of it a golden rule to be ever observed is :—*When what we are doing produces pain, desist; or mayhap the remedies employed may prove infinitely worse than the existing disease.*

If the Eustachian ducts be permeable, and the patient has arrived at a period of life capable of understanding what is said, the natural appliances are amply sufficient for forcing the amount of requisite fluid into the cavity of the tympanum. Direct the patient to snuff up a small portion of the fluid, lying down, with the head slightly depressed and inclined to the affected side; as the liquid is arriving at the back of the fauces the nose should be tightly held, the mouth closely shut, and a forcible expiration made. A small portion will be certainly driven far into the tube, and by retaining the position a short time, will find its way into the tympanum. I have repeatedly had patients who, in my consulting-room, have told me the precise moment when the drop has penetrated, from a peculiar sensation which they generally describe as occurring in the head. If this method fails, and it does not, nor cannot always succeed, the Eustachian catheter should be introduced, and to know if this is successfully done should be proved by blowing through it, the otoscope being first properly applied, when the sound will distinctly strike the operator's ear. As soon as its proper position is correctly ascertained, a few drops of the fluid ordered should be dropped into the lips of the catheter, and allowed to trickle down, when a smart puff from the mouth forwards it the rest of the journey. A very small portion of any fluid, except when a perforation of the membrana tympani exists, should be attempted to be forced into the middle ear, in amount not exceeding two minims.



Introduction of Eustachian Catheter.

THE USE
OF THE EUSTACHIAN CATHETER.

MANY people object to the Eustachian catheter, and it is in disrepute with members of the profession, but I believe it to be impossible to successfully treat ear diseases without it. Like any other instrument used in surgery, it may be, and no doubt is, injudiciously and needlessly employed, but, both as a remedial agent, and as a means of diagnosis, it is of inestimable value.

The cases are very numerous where all the india-rubber bags in the kingdom, squeezed either at the time the act of deglutition is being performed or not, will fail to send air into the tympanic cavity; but where a properly introduced catheter, with the surgeon's mouth applied to it, will readily accomplish it; and the method of applying the instrument should be more generally taught in our schools and hospital practice than is at present the habit. To pass a catheter into the Eustachian tube the patient should be placed either in a seat with a high back, or in a chair placed against the wall, the catheter, which ought to be made of silver, should be slightly warmed, which can be done by friction. The instrument being grasped loosely between the index finger and thumb of the right hand, the thumb of the left hand being employed to press upwards the septum narium, a proceeding which greatly facilitates the operation, particularly in people with beaky noses, the point of the catheter should be quickly swept forward along the floor of the nasal fossa; if the point be delayed at the orifice, sneezing is immediately excited, and the proceeding must be delayed, the patient not unfrequently objecting to the re-introduction of the instrument. Having arrived at the back of the fauces, the catheter should be slightly withdrawn, gently rotating it to the right or left according to the tube, when the orifice of the Eustachian opening is hit, the spasmodic action excited by the passage of the instrument will help to turn it completely round, so that the rings on the end, instead of looking upwards and downwards, will now point from side to side. Push it gently onwards until resistance is felt, when the beak will have arrived at the osseous portion of the tube, and in many cases will be firmly grasped, so firmly that considerable force is required to disengage it. Then air can be blown into it, either with the mouth or an instrument. Should the latter be used, a piece of elastic tubing should connect the wind instrument and the mouth of the catheter; this is done to avoid the consequence of the patient starting forwards on receiving the puff of air. Should the nozzle of the bag be applied directly to the top, a jerk forward drives the instrument in, causing great pain.

This accident has occurred to myself, so that I prefer, in most instances, to inflate with my mouth; occasionally this cannot be done, when an elastic piece of tubing, a foot in length, should connect the instrument.

Ingenious appliances have been invented for steadying the instrument, and, no doubt, for the purposes of syringing or fumigating, and failing the hand of an assistant, are useful; but the latter is preferable. If the orifice of the Eustachian tube is not readily hit, the catheter should be withdrawn and again introduced, as much needless inconvenience is caused to the patient by fumbling about for the opening. Malformations in the passages are of constant occurrence, which it is necessary to bear in mind; for instance, the *septum narium* is sometimes deflected to one side. According to Haller, this occurs most commonly on the right side. The vomer and spongy bones may, from abnormal development, so encroach on the passages as to leave no room for the entrance of an instrument. We rarely find this at both sides, and when existing, attempts at Eustachian catheterism should not be made; but if, say, the right side be free, and it is desired to operate on the left Eustachian tube, the catheter may be introduced at the *dexter nostril*, and passed across. The instrument used must have a prolonged beak. This operation will require a steady hand, and cannot be accomplished without causing considerable discomfort to the patient, but in many instances such a proceeding becomes imperative in treatment.

TONSILS ENLARGED.

Enlarged and diseased tonsils, we are told by some writers, are never, and, from the position of the glands with regard to their bearing on the Eustachian opening, can never be a cause of impaired hearing. Both in foreign and home literature this assertion is repeatedly found ; but that it is a fallacy is unquestionable, for in very numerous cases the morbid condition of these glands is the primary cause of defective hearing. The wholesale extirpation of the amygdalæ in every unfortunate who complained of deafness, was at one time so much the fashion that a converse mode of practice crept in, and the above assertion met with many ready believers.

Simple hypertrophy of the tonsils, when existing to any extent, must and does impede the action of the muscles in the neighbourhood, and an inflamed and congested state of these structures, ever implicating a considerable area of the mucous membrane at their base, still more impedes muscular action and contracts the natural orifices, and among them the Eustachian openings. This is a patent fact to all who give even a slight attention to the subject.

A patient complains of enlarged tonsils, with more or less deafness of either one or both sides ; if the deafness exists on one side only, the tonsil of that side will be usually the one affected, or more affected than its fellow ;

and when, under proper treatment, the gland subsides to its normal size and condition, in the majority of instances the hearing will be completely restored. In no case, either in the young or adult, should excision of the tonsil be performed where the glands present a congested appearance with an enlarged base; more mischief than benefit is almost certain to accrue, if under such conditions the knife is used. Tonic treatment, with astringent applications and gargles, should be employed, and I have found much benefit in some cases from superficial incisions, made with a gum lancet. When such an appearance of the throat is found, the enlargement of the gland is secondary, and is due to the inflammatory condition of its investing membrane, which finds its way into the substance through the orifices of its numerous ducts. Extirpation is here more likely to increase than cure the affection for which the operation is performed, and in some cases a chronic and incurable irritation may be initiated. Another argument against excision of the tonsils is the fact of their enlargement almost always occurring during the period of childhood and youth, when the whole glandular system is peculiarly susceptible of irritation, which passes away when the menstrual flux in women is established and the virility of man is confirmed. Until these epochs the tonsils are frequently the objects of metastasis, and the affection locally treated is of systemic origin.

Cases do occur in childhood where, as a *dernier ressort*, excision must be had recourse to; but they are rare. Such a case was lately under my care. Emily L., an interesting girl of twelve years, born in Melbourne, and delicate from her childhood, was brought to me suffering from considerable deafness. The stuffy way the child spoke led me at once to examine the throat, the amygdalæ were unusually enlarged, in fact, completely shutting out all behind them. She complained of difficulty of swallowing, particularly fluids of which she could take only very small quantities at a time. The child had constant hacking cough with considerable bronchial irritation; the right nares was blocked by a polypus;

and another small polypus sprung from the left external meatus. These latter I snared, and placed the child on ferruginous tonics, with astringent applications to the throat. The parents became rather impatient at the slow progress of the case, as they were anxious the child should return to school, so I excised both glands; the hacking cough ceased, the bronchial irritation subsided, the child regained her hearing, and in six weeks afterwards was hardly recognisable as the same poor suffering little mortal that had so lately come to me.

Another case was under my care in 1870—John Barrett, aged nine years, when aged five years had several severe attacks of bronchitis; he applied at the Samaritan Hospital, when Mr. Spencer Wells excised both tonsils, which were largely hypertrophied; he subsequently never suffered from bronchial affection, he gradually regained his hearing, and was, in all respects, much improved until a few months before his visit to me, when he caught a severe cold; otorrhœa of the left ear occurred, the mucous membrane of the throat was swollen and puffy, the right nasal duct was obliterated from congestion, and the left nearly so. The boy was very deaf. I prescribed tonics, but had not an opportunity of seeing their effect, as the child was not brought to me again. I give these examples to show there is no hard and fast rule which admits of no deviation; instances will occur where removal of the tonsils is attended with felicitous results, but other means should have had a full and efficient trial, especially in the early periods of life, before an operation is had recourse to. There is a condition of the tonsils not unfrequently met with, and I have generally observed it in adult males from 25 to 30 years of age; the throat lining is perfectly healthy, but the tonsils project across the opening, very much resembling walnuts, with the exception that the corrugations in the glands are deeper and more marked than those of the nut-shell, having a hard, gristly feel to the touch; topical applications are usually useless, and there is frequently much inconvenience and discomfort arising from them. In such cases the simplest proceeding is to slice off both the tonsils, resulting in immediate relief and cure of the disease, with many chances against its recurrence.

There are many instruments invented by different surgeons for excising the tonsils—guillotines, scissors, and various knives, any of which may be used according to the operator's fancy. The simplest tools for its performance are, a spring forceps and probe-pointed bistoury. If the operator be gifted with a moderate amount of ambi-dexterity, the knife may be used with either the right or left hand, according to the position of the glands to be operated upon, or the surgeon may stand behind the patient, when excising the right amygdala. The forceps should be used for the purpose of steadying the substance and preventing it, when severed, from slipping into the throat; if the gland be pulled too much on the stretch and the incision made at its base, important vessels may be wounded, which will necessitate tying the carotid. When properly performed, the hæmorrhage will generally be of no importance; if it becomes desirable to check it, the cut surfaces may be swabbed with a strong solution of sesquichloride tincture of iron.

Two cases are recorded in the *Lancet*, of Oct. 29th, 1870, by Dr. Wharton Hood, where excision of the tonsil was followed by considerable hæmorrhage, resisting all the usual means of arresting it, until spontaneous sickness, in the first place, stopped the bleeding. In the second case, adopting Nature's hint, vomiting was excited with a like result, attributed, no doubt correctly, by the author to mechanical action.

Those authors who have contended that enlargement of the amygdalæ exercise no influence on the aural structures, err in an equal degree with those surgeons who unhesitatingly sweep off these glands whenever their growth is abnormal.

Dr. B. Frenkel, of Berlin, is in the habit of using fine needle points of chromic acid for the local treatment of hypertrophied tonsils, and speaks highly of its efficacy; he further recommends, in some cases, the injection of tincture of iodine into the glands, in the proportion of iodine one, glycerine one hundred.

EUSTACHIAN TUBES.

It has been already shown what important appendices the Eustachian ducts are to the aural structures, and how the sense of hearing is largely dependent on their healthy condition; and as, in the diseases of other parts, and the different causes of deafness, the affections to which they are liable and the appropriate treatment, have necessarily been dwelt upon, it becomes superfluous to devote a long chapter to their further consideration; but there are some morbid conditions which arise in the ducts themselves, and are not caused by the diseased condition of the neighbouring parts extending to these tubes. Tumefaction of their investing membrane; a granular condition of the same; redundant mucous secretion, or crusts of inspissated mucus, in some cases completely obliterating the canal; ulcerations from any cause implicating the Eustachian orifices, and extending through the ducts; these affections arise in the contiguous regions, and the affection of the Eustachian tubes is by process of implication. Though the affection may have subsided in its original birthplace it may continue in an active or chronic condition in the tube, which is, however, unusual, for as it becomes affected by the morbid condition of its neighbourhood, so it also usually partakes of its benign influence.

Stricture of the tube may arise from diseased products in its own structure; but the rareness of such an affection is justified by the fact that throughout the extensive experience of the late Mr. Toynbee, such a case came but once under his notice.

This case was, however, one of peculiar interest, inasmuch as Mr. Toynbee not only saw the case while alive, but had the very unusual opportunity of a *post-mortem* examination. Such opportunities are so rare, and, when occurring, so instructive, that I give the author's description.

C. J., aged 45, was visited by me in the month of November, 1849. He was dying from tubercular disease, so that I was precluded from making so minute an examination as would have been desirable. The history of the origin and progress of the deafness, as far as could be ascertained, was as follows:—About twenty years ago the patient suffered from a violent inflammation in the right ear, followed by a discharge from the external meatus, which had continued almost without intermission up to the time he was seen by me. For a considerable period this ear had been unable to distinguish sounds, and the left ear had been growing less and less sensitive to sonorous vibrations during the preceding six or seven years. No pain had been felt in it, however, and there had been no discharge from the external meatus. Upon inspection, by means of a speculum and lamp, the membrana tympani of the right ear was observed to be absent, while the mucous membrane lining the tympanic cavity was very thick, and covered by a large quantity of purulent matter. In the left ear the lining membrane of the external ear was slightly reddened, and the membrana tympani was as white as writing paper, while the handle of the malleus, usually so distinctly seen, could not be distinguished from the surrounding membrane. Towards its centre the surface of the membrana tympani had lost the natural shining appearance, but a small portion of its surface on each side of the handle of the malleus, although perfectly white, was so smooth as to reflect the light of the lamp. As the patient was in a state of great debility, the otoscope was not applied to either ear to test the condition of the Eustachian tube.

The patient died a few days after the examination. The *post-mortem* appearances in the right ear were a thickening of the lining of the tympanic cavity, with patches of ulceration, with a carious condition of its upper wall, the Eustachian tube being healthy. In the left ear the membrane was found to be white and thick, the parts anterior and posterior to the handle of the malleus were soft and attenuated. The white appearance was due to the presence of mucus in the tympanic cavity, in immediate contact with the membrana tympani. So softened was this portion of that membrane, that, on applying the slightest pressure, the fibres composing it gave way, and three small orifices were produced. The cavity of the tympanum and mastoid cells were filled with thick white mucus, and no air was discoverable. The mucous membrane lining the cavity was also thicker than natural. The internal portion of the Eustachian tube, for the length of half-an-inch was healthy, but at about that distance from the cavity of the tympanum there was a sudden constriction, and for the length of about a line and a half the tube was so contracted, that, even when its superior wall was removed, it was with difficulty that an ordinary-sized bristle could be introduced into the opening. This stricture resulted from the external and internal walls of the tube pressing against each other, the small space, still permeable, being at the upper part. The more remote cause of the stricture would appear, however, to have been an enlargement of portions of the bone constituting the external and internal osseous walls of the tube, the former being at this part twice its natural thickness and somewhat rough, while the latter was forced outwards by the dilatation of the carotid canal, which, pressing thus upon the cartilaginous portion of the Eustachian tube, with which it was in contact, produced a flattening of the natural concavity of the internal wall. The mucous membrane lining the Eustachian tube was in a natural state.

Now, in this instance there was a double constriction—one inherent to the tube, the other extraneous to it, and both, I believe, of rare occurrence. Even here the occlusion was not perfect, as a bristle could be passed through the stricture, so that air was not entirely excluded from the tympanic cavity, though the channel of communication by which it is supplied was not sufficiently open to allow of the redundant secretion of the middle ear escaping through it. It is very probable if this man was otherwise healthy that the condition of the tube, provided the constriction did not increase, would not have diminished the hearing power in that ear, or only in a very inappreciable degree. The condition of the tympanic cavity, the mastoid cells, and membrane, was amply sufficient to account for the establishment of entire cophosis.

The onset of deafness during the continuance of pulmonary disease, particularly when it is not of an acute character, is of every day occurrence. I have for some time had an opportunity of seeing this strikingly exemplified in the person of a lady suffering from chronic lung disease. Whenever the affection becomes a little more active, pain is invariably set up in either ear, most generally in the left, at which side the greatest lung affection exists. On inflating the tympanum, excessive tympanic secretion is readily detected, which continues until the active tubercular irritation subsides, when the ear gradually recovers. Each attack, however, evidently decreases the hearing power, no doubt from some of the exuded matter drying up in the chamber and tubes, every active recurrence of the affection adding its quota to the existing mischief. If the graver ailment continues in the chronic form, and the patient's life be prolonged, it will most likely end in complete deafness, which, under the circumstances, will not admit of remedial measures for its relief.

The pain affecting the middle ear during pulmonary and bronchial, tonsilitic, and other inflammatory affections of these regions, can be readily accounted for by the nervous communication existing between these parts, through the tympanic branch of the glosso-pharyngeal nerve ("Jacobson's nerve"), which supplies the lining membrane of the tympanum and Eustachian tube. When a stricture of the osseous portion of the Eustachian tube, or a stricture of its cartilaginous portion, from exostosis of its own walls or of the carotid canal exists, recourse must be had to puncture of the membrane, as the absence of air in the tympanic cavity will cause a shrivelling-up of its contents, and collapse and withering of the membrane itself; and there is less difficulty in such cases of keeping the perforation open. The patient should also be placed under a long-continued course of the iodide of potassium; but such a diagnosis must be arrived at only after prolonged and patient investigation.

NASAL PASSAGES.

The affections of the nasal passages so speedily engage the aural structures, in the different morbid conditions occurring there, that the treatment of diseases of the nose becomes a part of aural surgery.

In all ranks of life, in the early ages of childhood, morbid affections of the Schneiderian membrane are of common occurrence, and this membrane would seem to have a peculiar sympathy with a diseased condition of other structures, particularly in gastric irritation. The habit so common among children of picking the nose when suffering from worms in the intestinal canal, a symptom general to the presence of all intestinal parasites, but more obvious when the patient is suffering from ascarides, where the irritation of the nostrils and anus, and in females of the pudenda, is pathognomonic of the affection, and is too well known to require even passing notice. In describing catarrhal affections of the nose, the terms rhinorrhœa and ozæna are synonymously used, both signifying nasal discharge; but the term ozæna should be restricted to those cases of fœtid discharge, occurring from an ulcer situated in the nasal passages, and the term rhinorrhœa be used to denote an ordinary catarrhal affection of the Schneiderian membrane, inoffensive, and resulting from irritation to its surface from cold. The latter affection being that which most frequently affects the ear, from the redundant secretion being forced into the Eustachian tubes, and their lining membranes becoming tumefied, thus obstructing the free passage of air to the tympanum. The early stages of influenza and an ordinary cold in the head are examples of this state. We have only to look at the pearly drop, so frequently dangling from the nose of our fellow-pedestrians on a raw cold day in January, to see how susceptible is the nasal lining to irritation from atmospheric conditions, and its intimate relation with the lining of the Eustachian tubes will readily account for the ear being speedily implicated.

There is frequently a discharge from the nostrils in children having a strumous diathesis, not generally offensive, but of a semi-purulent character, and the margin of the nostrils and inside of the *ala nasi* are usually the seat of small ulcerated patches, generally produced by the child picking the nose, and constantly rubbing off the scabs. In these cases it is usual to find the amygdalæ enlarged, and the mucous lining of the fauces congested and unhealthy. The child not only hearing badly, but the condition of the system engendering a listless and inattentive habit, makes the hearing power appear more diminished than it really is. To invigorate the constitution, and to correct its diseased tendency, must necessarily become the primary object, but it will be requisite to employ local remedies to dissipate the morbid condition which exists in the nasal ducts, and probably in the Eustachian tubes also. Much benefit will be derived by the use of a weak solution of the permanganate of potash, which will be most readily applied by means of a small silver tube, curved at the end, and perforated by several small holes; the other end of the instrument being fitted with an india-rubber ball, which will contain about an ounce of fluid; with this the passages can be more thoroughly washed out with the solution than by the ordinary method of snuffing, which it is very difficult to get children, and not unfrequently adults also, to properly perform.

When the membrane of the nostrils has assumed a more healthy appearance, and the *aphthous* ulcerations are healed, a solution of the chloride of sodium may be substituted for the permanganate solution, and its use persevered in for some considerable time. Unless the disease has been of very long standing, and has implicated the tympanic lining, no special treatment of the ear will be required. As the child overcomes the tendency to glandular disease, and the mucous linings regain their healthy condition, the hearing power, which has been diminished by the morbid state of the Eustachian ducts, will, as soon as this condition is removed, regain its normal character.

In the systemic treatment of scrofulous ozæna, marked benefit is derived from a residence at the sea-side, combined with sea-bathing If the weather be unsuitable, a sea-bath in the house should be taken daily. It will be well before going into the water to place a little cotton wool, previously soaked in almond oil, at the entrance of the meatus. I have known several cases where sea-bathing has been discontinued from its producing ear-ache, which this simple expedient will guard from. A substitute, though a bad one, where sea air and bathing are unattainable, is a bath made daily with freshly-powdered rock salt.

SYPHILIS AFFECTING THE EAR.

SYPHILITIC affections of the nose affecting the organ of hearing are, as far as my experience goes, of rather rare occurrence, and it has often been a matter of astonishment to me how extensive may be the existing disease, or the effect of its ravages, without the ear being in the slightest degree implicated. No doubt the converse is sometimes met with, but I believe it to be very exceptional. Syphilis, in its early stages, may, and does in many cases, affect the hearing power in various degrees of intensity. Some time since, Dr. Keyes, physician to the Bellvue Hospital, published thirty-two cases under his own and Professor Van Buren's care, where marked nervous symptoms arose after the contraction of syphilis; attributed by him, to congestion, from which the nerve of audition would suffer in common with its fellows.

As the iodide of potash, given for the treatment of syphilitic disease, does restore the efficiency of the auditory apparatus, it is a reasonable deduction that the cophosis is induced by the contraction of the venereal poison; but when this congestive stage, which blunts the nerve of audition, passes away, the subsequent stages of the disease rarely implicate the ear of the person so affected. Whether a parent infected with syphilitic taint transmits to his or her offspring, through successive generations, a predisposition to deafness, by which this, in some instances, hereditary ailment is accounted for, is a plausible but rather too speculative theory to enter upon. It is easy of assertion, but as yet is incapable of proof or contradiction. Where the auditory structure is not commonly affected in a constitution, which has been primarily impregnated with the disease, there is a difficulty in imagining that its effect, in subsequent generations, is so peculiarly inimical to that organ, which originally seemed to possess as peculiar powers of resistance to its influence. The affections of the eye from syphilis are as frequent as those of the ear are rare.

I am not alluding to those cases when a child comes into the world covered with unmistakeable evidences of a parent's indiscretion, and where its tender organisation can present but feeble opposition to such a baneful influence, though I believe even in such cases, in ten instances out of twelve, the eye, and not the ear, is the organ most affected, and I have had considerable opportunities of judging this during a twelve months' residence in the Dublin Lying-in Hospital.

There is a condition of throat, syphilitic in its origin, and liable to implicate the Eustachian ducts—erythema with follicular exudation in the pharyngeal mucous membrane, and which is apt to be confounded with a simple catarrhal affection. Professor Sigmund recommends in such cases the frequent use of a douche composed of a solution of zinc and tannin, and if this cannot be tolerated, a solution of rhatany and opium. If a case of deafness occurs without any obvious cause, and the parts, as far as we can ascertain, are healthy, a course of the iodide of potash, or small doses of the perchloride, or, as I prefer, the green iodide of mercury, should be long persevered in. It is only by patient use of the drug that any beneficial result can be hoped for. But it by no means follows that if success, either partial or complete, attend the administration of either of the foregoing preparations, that syphilis was at the root of the ailment. With or without the addition of colchicum, the morbid products affecting the organism of the ear, arising from a gouty or rheumatic diathesis, yield to the same treatment.

A merchant captain who first consulted me three years ago for considerable loss of hearing power in both ears, and with an evident constitutional tendency to rheumatism, while at sea, particularly in warm latitudes, suffers no inconvenience in this way, the hearing power being normal; but after a few days on shore in this country he gradually becomes deaf. Five grain doses of the iodide of potash, three times daily, sets him right in about a fortnight; but at each of his biennial returns home, the same symptoms invariably recur, yielding to the same remedy.

The man has never contracted syphilis, and is, to all appearance, steady and sober.

NOISE IN THE EARS—TINNITUS AURIUM.

Tinnitus Aurium, or noise in the ears, is as common as it is in many instances a very distressing affection. It may, or may not be accompanied with deafness, but I have met with it in several cases when hyperacusis was well marked, and in all such the noise was described as intolerable.

Tinnitus aurium is essentially a nervous affection, and arises from some irritation to one of the numerous cords, described by Corti, ramifying in the cochlea, and as it is in this structure that distinctions of sound are conceived, the extraordinary character of these noises, which are likened to everything that is imaginable, and much that goes far beyond the power of imagination to conceive, may be accounted for. I remember one patient, who described herself as suffering from a noise in the ears, which she could not characterize better than by saying it was something between the chirrup of a grasshopper and a piano playing loudly. It would be rather a difficult matter to conceive such a sound, but the surgeon must be always prepared to hear very extraordinary similes used by patients in describing this affection.

Noise in the ears, though caused by some pressure on, or affection of, some one or more of the nervous extremities, may be—and is frequently—a secondary affection, symptomatic of other morbid existences, and is occasionally a symptom of very grave importance, being a usual precursor of apoplectic and paralytic seizures. It is also produced by different medicines in daily use. Many people cannot bear even a small dose of quinine without its causing a buzzing sensation in the ears; a similar feeling is caused by the different preparations of opium, particularly the tincture, and those who resort to this drug, either for its stimulating or sedative effects, are rarely, if ever, free from constant noises in the head. Profuse hæmorrhages, occurring at the time of parturition, or during the performance of surgical operations, also give birth to this troublesome affection, and is not uncommonly that of which the patient makes the bitterest complaint. In fact, any condition of system which, sympathetically affects or directly influences the cranial nerves, whether it be defective nutrition, from exhaustive discharges, or a congestive condition induced by over plethora, or organic or functional affections of the heart by which the due and regular supply of blood to the brain is abnormally altered, such, with numerous other systemic disturbances, too manifold to enter upon, produce tinnitus aurium.

But though, to decide on the origin of the affection, it is necessary to ascertain the condition of the entire system, the aurist has only to do with those cases where the tinnitus arises from some morbid affection existing in the aural structures. A very common cause of tinnitus is an accumulation of wax in the meatus, which, by the pressure it exercises, keeps up constant nervous irritation. Polypi and growths of a fungous character produce a similar effect. Deposition of dried-up secretions, bony enlargements, and the different specific diseases of the ear, which have been already mentioned, also give rise to the same sensations.

The buzzing sound in the ear, with a sense of weight and fulness in the organ, when suffering from a cold in the head, is familiar to us all. This is caused by obstruction of the

Eustachian duct from over-abundant secretion, and the manner adopted in attempting to cleanse the nasal passages effectually defeating the intention. A gentleman is now under my care who has had distressing noise in his left ear for over two years, with constant throbbing and slight otorrhœa; he has undergone prolonged treatment for derangement of his heart, his lungs, his stomach, his kidneys, and his liver, according as each of these organs has been diagnosed as the primary cause of his complaint, and none of which are in the slightest degree affected, with the exception of his powers of digestion, which have become weakened from constant dosing. On his first visit to me he was suffering from the additional inconvenience of a large seton in the nape of his neck. It never dawned upon the different gentlemen by whom he was treated that the origin of the disease might lay in the ear. But so it was; the membrana tympani was entirely obscured by the presence of a polypus, unusually vascular, pulsating strongly, and in contact with the membrane. The pulsation was immediately controlled by pressure on the left carotid. For two years my patient has been suffering in health and pocket, his symptoms becoming worse instead of better under the different treatment employed. An examination of the ear—the necessity for which one would naturally suppose was indicated by the existing otorrhœa—would have saved this, but the ear discharge was attributed erroneously to constitutional and not to local causes.

I give the case to show that though this distressing affection frequently exists with no apparent disease in the ear, and is due to some morbid affection of the system, by which the aural mechanism is directly influenced, or is sympathetically engaged; yet, as the ear is the point to which the patient's attention is drawn, so should a primary and searching examination be made of this organ; so as to arrive at a correct diagnosis of the cause of the tinnitus, and thus avoid the error which successive medical men fell into in the instance just related.

The majority of affections to which the aural structures are liable are most generally attended with more or less noise, and the character of the tinnitus will often help in fixing the precise part from whence the morbid influence proceeds, unless, as is not unfrequently the case, the most fertile imagination is unable to realize the allegorical description which the patient gives. When the effect of *climactic* influence is palpable, the membrane of the tympanum will usually be found more or less disorganised, and the treatment directed to it will show whether the interior of the drum and Eustachian ducts are also implicated. Noise in the ears, not unfrequently attended with considerable exaltation of hearing power, is met with among females who lead a sedentary and confined life; milliners and sempstresses are frequent sufferers from this affection, produced, in the majority of these cases, from a costive habit and languid circulation, from insufficient out-door exercise, and many hours spent in a sitting posture, with the not unfrequent addition of a scant supply of nourishing food, Numerous are such applicants to the different charitable institutions of the metropolis. Tonic medicines afford considerable relief, and the patient, thankful for small mercies, is lost sight of for a time, returning again as soon as the beneficial effect of medical treatment has been overcome by a return to their compulsory mode of living, the exaltation of hearing gradually diminishing until an opposite or cophotic condition is established.

Persons who exceed in the use of spirituous liquors usually suffer from tinnitus; and a case lately came under my care where excessive smoking was the evident cause, as, on abandonment of that habit, the buzzing sound complained of completely subsided. Gastric derangement is a certain excitant to tinnitus, and the habit of bolting food, insufficiently masticated, with a gluttonous indulgence of the appetite, by which the powers of digestion are unduly taxed, is a sure producer of this affection.

OTALGIA.

Pain in the ear, without any inflammation in the meatus, and with a perfectly healthy condition of the membrane of the tympanum, may occur, and is sometimes of a most agonizing character ; though the ear is the part referred to as the seat of pain, the whole side of the head is generally implicated, and will usually be found tender to the touch. This pain not unfrequently arises from irritation caused by carious teeth, the pain commencing at the tooth, and shooting towards the tympanic cavity, where it culminates, producing intense suffering.

As long as the offending cause exists, a recurrence of these attacks is always to be apprehended, so that all diseased teeth should be extracted.

In some cases the teeth are, to all appearance, quite sound, but firm pressure with the fore-finger on each tooth will, if the pain arises there, at once reveal the offender. A few drops of vinum opii dropped warm into the meatus will deaden the acute pain ; but when once the affection is traced to this source, removal of the tooth becomes imperative, as the slightest exposure is liable to again produce the suffering, which sometimes takes on a periodic character, simulating neuralgia, for which it is not uncommonly mistaken and treated for, whereas it is simply tooth-ache, engaging the nerves of the ear, with which the nerve supplying the teeth anastomoses.

If Otalgia proceeding from this source has existed for a considerable time, and only palliative measures have been adopted, it may grow into true neuralgia, which will continue even after the original cause of the affection has been got rid of, and will require tonic treatment. The carbonate of iron, with or without quinine, will, in such cases, be of much benefit; and as the sufferer is usually weak and of an anæmic diathesis, a liberal allowance of port wine will be a valuable adjunct. In some instances I have found it of more signal use, in putting an end to these periodical attacks of pain than either the preparations of bark or iron, though long persevered in. The preparations of arsenic, particularly Fowler's solution, are of much value in the treatment of Otalgia having a periodical tendency to recur.

NERVOUS DEAFNESS.

Nervous Deafness is a definition employed by different authors with a widely differing signification. So far, the term might be applied to characterize every phase and form of cophosis, as all degrees of deafness, from slight hardness of hearing, to that when the patient is described as stone-deaf, is caused by want of action, or total suspension of the functions peculiar to the portio mollis nerve. This want of action may be caused, and is most frequently the consequence of impediments existing external to the nervous terminations, which impedes or renders entirely nugatory the machinery by which the force of the external vibrations are conveyed to the nerve of audition, and the consequent inefficiency or loss of this mechanical power is the primary cause of the deafness, though the actual cause is the quiescence of the terminal filaments of the auditory nerve, which, though in a perfectly healthy condition, and in readiness to receive and transmit to the source of the sense all external impressions, remains inefficient and inert, failing that stimulus which awakes them into action, so that all deafness might without error be termed nervous; but such a definition would lead to serious mistakes in the treatment, so that I would exclude from under such a heading every case of cophosis, where the slightest symptom of disease can be detected in any other part or portion entering into the formation of the organ of hearing. But true cases of nervous deafness may be initiated from disease having existed for some time in the transmittory apparatus; and of such the following is a good example, given in the patient's own words.

A. B., a bank clerk, aged 35, a strong, healthy young man, says: When at home with my own family I hardly observe that I am deaf, except in damp or foggy weather, when it forces itself upon me; and though my friends do not remark it, I find I have to make a considerable effort to prevent myself losing some words of a sentence, particularly if the remark is not addressed to me, or if other people are talking at the same time. The thought of getting deaf has been a great source of trouble to me for some time, and I fancy has made me very nervous and irritable. When, in the course of business, I have any conversation with the heads of the establishment, my deafness gets ten times worse, and when one day I was questioned concerning it I lost all power of hearing, though this was one of my good days. The deafness in this instance arose from a mild catarrhal affection of the tympanic cavity, which completely yielded to the treatment employed, but the nervous loss of hearing power continued for some considerable time after all symptoms of disease had disappeared from the tympanum, but eventually, under a course of tonics, with change of air and scene, these unpleasant symptoms disappeared also.

In cases of injury from falls or blows, resulting in deafness, the conclusion is too often jumped at, that the nerve has been injured, and thus is the infirmity accounted for. The machinery which awakes the nerve into action is far more exposed to injury, and is much more likely to be the cause of deafness than the nerve itself, which Nature has encased in an almost impenetrable stronghold.

In determining cases of true nervous deafness, the application of a vibrating instrument or watch over different points of the cranium is a valuable aid in the diagnosis, though in itself it is not to be considered infallible.

When a case of deafness presents where no trace of disease can be found in any way connected with the ear, and different hearing tests have been applied, the cause of it may probably, with correctness, be attributed to the nerve, which is either primarily or sympathetically affected. Blunted sensibility of the auditory nerve may be engendered by the disorganisation and disease of other structures. The nerve resuming its normal character and functions as soon as the sympathetic affection in which it is engaged no longer exists.

In cerebral congestion we have a well-marked example of this; deafness in such cases being a very prominent symptom, disappearing as soon as the morbid condition affecting the nerve is removed.

Anæmia has been already alluded to as a cause of deafness, and it may be properly considered as a cause of nervous deafness; the nerve of audition becoming affected from a deficient supply of nutritive matter and a consequent diminution of its power. This condition is met with in all stages—from that aggravated form described by Dr. Mason Good in his "Study of Medicine," and called by him *Marasmus Anhæmia,* which is characterised by a ghastly paleness of the general surface, loss of appetite, a quick and feeble pulse, irregular evacuations, which are offensive and dark coloured, accompanied with great langour and emaciation. This form of the disease is common to both sexes; but simple anæmia is almost peculiarly a disorder of females, and is frequently associated with paramenia. Both ears are equally affected, and constant humming sound is complained of, which is intensified by the slightest extra exertion, or even by stooping. These sounds are caused by a deficiency in the blood current passing through the arteries, for not only is the blood deteriorated in quality, but it is also deficient in quantity.

Erhard and Bonnafont contend that nervous deafness exists when there is inability to hear the tick of a watch when in contact with the cranial parietes; but the nerves may be functionally disarranged by organic disease in some other part of the aural structure, and if this test only were relied on the original disease, which is re-acting on the nerve, may entirely escape notice, and all attempts to restore hearing power by treatment of the nerve as the offending cause must be futile. Kramer, in his work "On Aural Surgery," takes a gloomy view of what he considers as cases of nervous deafness. He considers, under this category, a fall from a height on the feet, buttocks, back, chin, or head, blows on any part of the head, violent explosions of artillery, or deafness supervening during the course of severe febrile diseases. He says when the deafness results from the above-mentioned causes we presume there is local congestion or some other organic change, either in the auditory nerves themselves or in their immediate vicinity, so that we are quite justified in using those general and local derivative means which are calculated to promote absorption. But, he adds, not one single case has occurred in my practice in which any benefit has been experienced from the use of these remedies. The prospect of success, therefore, being so slight, it is surely judicious to avoid tormenting the patient by the application of painful or debilitating counter-irritants, such as setons, moxas, issues, violent purgation, &c. On the other hand it is quite unjustifiable to attribute nervous deafness to nervous debility.

From such remarks, we must consider the author regards these cases as hopeless, and experience has taught him that the safest course is to let them alone. But many cases which have come under my care, have yielded such satisfactory results from treatment, I can only suppose those cases which came under Kramer's notice were peculiarly complicated, and I look upon debility as one of the commonest causes of nervous deafness. Large numbers of the humbler classes who seek dispensary relief are instances of this very affection. There is a general loss of tone in the whole system, with gradually increasing deafness, aggravated at any extra excitement, and invariably yielding to constitutional treatment. That impaired hearing power produced by the other causes mentioned by Kramer, though the sequel of injuries or of serious diseased conditions in the body are not so entirely unamenable to treatment as his remarks would infer, my own practice, and that of other gentlemen I have had the privilege of seeing, would disprove.

One case, the result of accident, under my care last year, affords a good example of what may be the result of that very treatment which Kramer objects to.

W. C., a cabman, had been thrown from his vehicle, his head coming in contact with the curb-stone; complete deafness was the result. He also suffered from numbness and loss of temperature in the right arm and hand; he was under treatment about three months—this consisted of irritation behind the ears, a seton at the nape of the neck, and the thirtieth of a grain of strychnine with quinine thrice daily. At his last visit he could hear distinctly every word of a sentence spoken across the room without the voice being raised. Here was a case of functional suspension of nervous power. The nerve of audition being that principally affected, caused, either by effusion or, it may be, by the violence of the transmitted shock. If no attempt had been made to remedy the mischief, this man's sole means of livelihood would have been lost to him, so that advice, which urges the futility of counter-irritant treatment, must be received with caution. Strychnine was given for the first month alone, without any apparent benefit. No doubt, in long-standing cases of deafness, arising from any of the foregoing causes, according to the duration of the infirmity, so will the chances of benefit to be derived from treatment be regulated.

PECULIARITIES OF HEARING POWER.

Many people who are very deaf, failing to distinguish a single word or even sound, without the aid of an instrument, are, when travelling in a carriage, particularly on rough and uneven roads, or standing in a building vibrating to the action of machinery, able to carry on a conversation with ease. There are other cases when persons who are hard of hearing in the house, particularly in small and low rooms, when out of doors can hear much better. But the first condition is that which I am now considering. It is observable in all these cases, that the improvement of the hearing power is in proportion to the vibratory force to which the body is subject, the greater and more continued the vibration the easier the power of receiving and distinguishing the sonorous undulations become. The fact of violent pulses of sound emanating from various sonorous bodies surrounding the person at the same time, but when the bodily vibration ceases, the power of receiving these pulses ceases also, indicate that the increased hearing power is due to the vibration of the body, communicated through the spinal column to the nerve, and though acuteness of the sense may be assisted by the violent sound waves, yet these waves are not of themselves sufficiently powerful to reach the labyrinth and cause that agitation to its contents, by which alone the sense of hearing can be performed.

There are various ideas with regard to this, but I believe that in all such cases in the chain of ossicles the cause of the deafness is to be found. We know that it is by actual mechanical irritation of the nerve, that the sense of hearing is brought into activity, and we further know that in these cases where the whole of the ossicula have been lost, though such a person is cognizant of vibratory action, yet it will have no effect in awakening the auditory nerve into action. Though two foramina communicate with the internal ear and tympanic cavity, and several authors suppose that sound waves penetrate to the nerve by the foramen rotundum, as well as by the foramen ovalis, I am of opinion that sonorous undulations can reach the nerve of audition by one channel only—namely, the one which is guarded by the base of the stapes, and therefore, unless some action can be communicated to this bone, all power of agitating the labyrinthian fluid, and thereby stimulating the nerve of audition into action, is lost.

Now there are two or more morbid conditions of the ossicular chain, by which this peculiarity of hearing may be plausibly accounted for, and that to which I would more readily lean, is direct immobility of the chain of bones, by the action of bands of dried mucus secretion tying them, latterly, anteriorly or inferiorly, to the internal walls of the tympanum or to each other, and thus their power of transmitting the undulatory current, from its reception at the membrane of the tympanum to its destination at the entrance of the labyrinth, is either crippled or completely destroyed, as far as the action of the membrana tympani is concerned, that is, by the direct and natural line of force. But a lateral motion may be given to them by the vibration of the osseous parietes, which is communicated to the bones of the cranium, through the vertebral column. The chain being once set in motion by this means, the pulses of sound impinging on the membrane of the drum, add further force to the movements, though, no matter how violent these pulses were, without the transmitted vibrations of the vehicle or building, they were powerless to stimulate the auditory nerve. That the vibrations communicated to the trunk are of primary importance is evidenced by the fact, that on their cessation the sense of hearing is lost. Again, relaxation of the membrane of the tympanum may so alter the position of these little bones, that their relationship with each other, which so admirably qualifies them for multiplying the vibrations which the membrane communicates to them, is so abnormally altered, as to deprive them of this faculty, but their contact with the tympanic walls renders them susceptible to vibrations, such as those we are treating of; but the difference of these two cases is, that one is easily diagnosed, and the other can be only conjectured.

If the speculum reveals the membrane presenting a decidedly concave appearance, bulging into the cavity of the drum, it is positive evidence that the chain of bones, which, in the normal condition of the parts, unite one membrane with the other, are huddled together, and their vibratory power lost; artificial inflation of the tympanum will place such an opinion beyond dispute; as the temporary restoration of the membrane, by forcible inflation, to its normal position, restores the normal hearing power.

To realise the idea which I entertain with regard to bands of lymph uniting the bones abnormally together, and attaching them at different points of the tympanic chamber, it is necessary to perfectly understand their position and bearing on each other when *in situ* in a healthy ear.

Persons who hear better in large rooms or in the open air, and those who hear better in a noise and where loud and general conversation is going on, are examples of two other different conditions existing in the aural machinery. In the first, the ear is generally affected through the circulation re-acting on the nervous system, and in such cases, either functional or organic affection of the heart may be found to exist; if the former, the liver will probably be at the root of the affection; in the latter, an affection of the great vessels may be present, or a fatty condition of the heart, the action of this organ being consequently imperfect. Whenever the circulation is the primary caûse of decreased hearing power, tinnitus aurium is invariably present, and if cardiac degeneration exists, by which the action of the heart walls is weakened, deafness co-existing, it will be found that the patient hears much better while in the recumbent position. Deafness does not necessarily accompany either of these morbid conditions, but in such cases I have repeatedly observed it, and when undertaking the treatment of cophosis of this character, it is very necessary that the practitioner should take a comprehensive view, and by no means confine his attention to the organ of hearing only.

In those cases where a person hears more acutely when loud and general conversation is being carried on, it is probable that the membrane of the tympanum is morbidly affected, either from a thickening of its walls or a bulging in of the whole structure into the cavity of the tympanum, arising from some affection existing in the Eustachian tube, which interferes with a due circûlation of air in the drum.

The membrane is still influenced by powerful sound waves, while those of a milder character fail to awake its perfect vibratory action.

RHEUMATIC AND
GOUTY AFFECTIONS OF THE EAR.

RHEUMATISM and Gout affect the auditory structures. And of the two forms of rheumatism, acute and chronic, the chronic form is that which usually engages the aural mechanism. The structures most affected in chronic rheumatism are the investing membranes of the nerves, the periosteum, tendons, ligaments, &c. All of these entering into the formation of the ear, are liable to the morbid effects of rheumatic action. But unless rheumatism has been of long standing and of considerable severity, the aural structures seem to enjoy a certain amount of immunity from its ravages, but, though cases of acute rheumatic disease are of frequent occurrence, and acute rheumatic deafness comparatively rare, it must be remembered that the ravages of rheumatism may early affect the nerve of audition, the periosteal lining of the labyrinth, the periosteum of the tympanum, and the bones composing the chain of ossicles and their tendons, as well as the fibrous, or middle layer of the membrana tympani, and such rheumatic disease of any of these structures, must impair the efficiency of the hearing organ.

Rheumatism and gout, its close ally, must therefore be regarded as among those diseases which cause deafness, and if loss of auditory power co-exists with such a diathesis, without we are enabled to detect any other cause for the cophosis, some one of the fibrous structures, or perhaps all, are affected by the disease. Local treatment in such cases, unless conjoined with specific treatment for the subjugation of the exciting cause of the malady, will be useless ; but combined with the proper general remedies for such a condition, local applications to the ear should not be neglected, but should be applied in the form of counter-irritation around the auricle. Iodine applications to the membrane of the tympanum, and the same in vapour or solution, should be introduced into the tympanic cavity.

NEURALGIC AFFECTIONS OF THE EAR.

Pain in the nerves supplying the different parts of the hearing apparatus is of common occurrence, and requires no special mention as an ear disease, though the suffering caused by it is occasionally of great severity. It is necessary, however, to distinguish a purely neuralgic affection from pain caused by inflammatory disease occurring in the ear, as in the one it is usually symptomatic of some other disease, or it is initiated from some other cause foreign to this structure, whereas the pain of inflammation arises from a serious affection of the ear itself, and may, if not checked, be attended with grave results.

Neuralgic pain may be produced by an offending tooth, or, it may be symptomatic of various affections of the system. When the seventh nerve is the seat of neuralgia, though the pain may be intolerable, if the ear is examined in its very acme, there is not the slightest appearance of any inflammation, nor does the examination cause any aggravation of the pain; whereas, an inflammation attended with a much less degree of suffering will be visible on examining the membrane, and the meatus externus will be exquisitely tender to the touch. In one case, local remedies of an antiphlogistic character are imperatively necessary, and their employment will have the effect of mitigating, and eventually subduing, the pain; whereas, in neuralgia, such treatment would only tend to aggravate it. As before stated, it is not the author's intention to enter on the treatment of diseases which affect the ear, in common with other parts of the body, though it is necessary to briefly allude to them. He refers his readers to the several works on these subjects for their treatment.

When neuralgic pain of the ear is severe, considerable relief will be had by dropping into the meatus a lotion composed of—vinum opii, one drachm; chloroform, one drachm; glycerine, half-an-ounce; and painting around the auricle a strong aconite liniment. But for the radical cure of the affection, that morbid condition of the system—of which the neuralgia is but symptomatic—must be sought out and rectified. In some instances the nerve irritation has been so firmly established, that it resists all attempts at cure, rendering the patient's life miserable, and wearing it out from the suffering produced. Division of the nerve has been tried in some of these cases with temporary benefit, but as soon as the nervous connection is again established the pain often recurs in full force.

USE OF GALVANISM IN DEAFNESS.

I ALLUDE to this vaunted remedy from the specious character it presents, and the consequent frequency with which persons suffering from deafness are tempted to give it a trial, in many cases a prolonged one, to find themselves in the end but disappointed dupes. The error which the majority of people fall into with regard to the cause of their deafness is, that some defect exists in the nerve of audition, and therefore galvanism cannot fail to cure, and this popular error is taken advantage of by quacks to cry up its application as a specific for all cases of deafness.

An affection of the nerve which causes deafness is, in comparison with a diseased condition of those structures which convey the undulations of sound to the nerve, of rare occurrence. What possible benefit can be derived in a case of cophosis, arising from any of those morbid conditions which have been treated of in the foregoing pages of this work, by the application of galvanism? Such a query might well puzzle the Prince of Charlatans to coin an answer for, unless given in the privacy of his den to the cophotic ears of his too credulous patient.

In such conditions of disease as have been already noticed, a galvanic current can have not the slightest remedial influence; on the contrary, is more likely to exercise an injurious tendency. As well apply a current to the organ of vision for cataract with the hope of recovering the defective sight, as apply it to the ear in by far the larger instances of decreased hearing power. I do not mean to decry the valuable agency of medical galvanism in skilled hands, nor do I contend that no cases of deafness can be benefited by its application.

Where the general nervous system is in a condition to call for such an application, the nerve of audition is affected in company with its fellows, and partakes of the benefit derived from the general treatment; but where deafness exists without any other nervous symptoms co-existing also, the chances are much against the nerve being the offending cause, and therefore the use of a galvanic apparatus can hold out but shadowy prospects of relief. At the express desire of some of my patients I have used galvanism, but, except in those rare instances when the cophosis was purely nervous and of recent standing, without the slightest benefit. I have also tried it in several cases where the origin of the deafness was doubtful, the extrinsic symptoms pointing to the nerve as the offending cause, but the results were barren. This has been the experience of all those who have scientifically practised aural surgery, and who were actuated with a stronger desire to benefit their patients than to line their own pockets. Electricity has been long employed in the treatment of deafness. Its results were, however, so unsatisfactory, that it had fallen into disuse; but it is now revived as a new remedy. It is therefore necessary to give to its therapeutic agency its true value. As before stated, there are cases where the auditory nerve, in common with the other nerves, is organically or functionally affected, and where galvanism, skilfully applied, may restore its faculty; but such cases do not justify its being cried up as a specific for all forms of deafness. For one case of cophosis that will be benefited by it, in nine hundred and ninety-nine it will be completely inoperative. For the dispersion of tumours of any kind occurring in the auditory structures it presents no advantage, as their removal can be more readily and effectually obtained by other and simpler means.

FACIAL PARALYSIS.

Facial Paralysis occurs uncomplicated and complicated with ear disease, in the former instance, it is probable the affection of the nerve generally exists prior to its giving off its tympanic branch, probably in the canal of Fallopius; but when facial paralysis co-exists with disease in the ear, it is probably caused by reflex action of the chorda tympani nerve, which is involved in the morbid condition existing in the cavity of the tympanum. The commonest cause of this will be found to arise from the pressure of a polypus, or fungous growth, acting on the nerve in its passage across the interior of the tympanum, it may also occur during an attack of otitis, or any acute affection of the aural structures, in which the interior of the drum is engaged. As the nerve, in its passage to the canal of Hugier, passes between the handle of the malleus and the long process of the incus, displacement of these bones, which occurs from several causes, may compress and stretch the nerve. Paralysis of the facial nerve, or of its branch, the chorda tympani, must affect the hearing power, inasmuch as the laxator tympani muscle is supplied by a branch from the chorda tympani, and the stapedius muscle by a branch from the facial. The effect of this condition on the auditory sense may be almost unobservable, except it be tested for; as the paralysis of one muscle will in some measure counteract the paralysis of the other; the function of the laxator tympani being lost, the membrane of the tympanum is more tense, and, therefore, more susceptible of receiving sonorous undulations when of not too powerful a character, but the power of the stapedius muscle, by which the membrane of the fenestra ovalis is tightened, being also lost, the vibration of the chain of ossicles is not so efficiently communicated to the contents of the labyrinth.

Professor Todd, in his "Cyclopædia of Anatomy and Physiology," says, the first action of the stapedius muscle is to press the posterior part of the base of the stapes against the vestibular opening; by the same action the long process of the incus will be drawn backwards and inwards, and the head of the malleus being, by this movement pressed forwards and outwards, its handle will be carried inwards, and the membrana tympani put on the stretch. Though the action of the muscle on the stirrup bone has this tendency, its function is more particularly directed to the vestibular membrane. I believe these muscles of the middle ear are very slightly subject to the act of volition, but that they are brought into play by reflex action of the facial nerve, being the effect of the stimulus originating from the sonorous body finding its way to the sensorium, which regulates that action by which the pulses of sound are, in the course of their transmission, either intensified or subdued, according to the requirements of the sense. Analogous to the iris, which contracts when the stimulus of light is too powerful and dilates to receive it when deficient, these muscles are primarily set in motion by reflex action, according to the intensity of the sound waves, and without such stimulus, I believe, they remain passive.

It has been argued, that by them, the shock of powerful undulations, such as those produced by the firing of a gun or cannon, are subdued, if we are cognizant that such a sound is about to occur. In other words, that these tympanic muscles, acting by the power of our will, so arrange the transmitting machinery, as to prevent or decrease the shock to the auditory nerve. No doubt, the knowledge that a loud report is about to occur, materially lessens the effect, but it does not follow that this is in consequence of muscular preparation. If strong rays of light are turned, suddenly and unexpectedly, on the eye, it produces a shock, but if these luminous waves are expected, it produces but little shock, though, until the stimulus of light is applied to the iris, by which the strength of the impressions are conveyed to the optic nerve, the iris remains quiescent, then contracting under the influence of reflex action.

For the treatment of facial paralysis, unconnected with deafness or disease of the ear, I refer my readers to the different authors who have written on the subject. When the paralysis is evidently connected with a morbid condition of the aural structures, of which it is most probably the effect, the disease existing in the ear must be removed, when the nerve, will, as a rule, resume its functions. When we consider how exposed an important branch of the facial nerve is in its passage through the drum, it is a matter of surprise how comparatively rare this complication is in the numerous affections to which the interior of this chamber is subject.

CONGENITAL DEAFNESS.

Following in the footsteps of previous authors on aural diseases, no work on this special subject seems to be complete without the consideration of one of the most lamentable conditions which can fall to human lot; I therefore give it a place in this work, though for the treatment—much less the cure—of congenital deafness, or for that fully acquired by disease in the early periods of infancy, I can offer few, if any, suggestions; nor has any author, though devoting chapters to the subject, given one practical hint which can be quoted with advantage. Some cases of congenital deafness overcome the infirmity without any treatment; I have such an instance under my care now for otorrhœa of the right ear. Up to the age of seven years he could neither hear nor speak, but the power of hearing gradually came to the right ear; and now, at the age of twenty-six, he hears passably on this side, is totally deaf on the left, and speaks rather indistinctly. Unfortunately, a gelatinous polypus has formed in the right meatus, and his hearing has become considerably impaired. The man is, as usual in these cases, of more than average intelligence. This is a rare exception to the general rule, which has been that congenital deafness, or deafness caused by neglected morbid influences in the early periods of life, remained a bitter cross to the sufferer throughout life's duration, unalleviated and unalleviable, defying all our vaunted skill, and resisting all our remedial measures.

In those instances, when the deafness is caused by diseases incidental to infantile life, if such morbid effects are early combated, a promise of successful results may be anticipated, but if the healing hand of time be alone relied on, and the fallacy of such reliance be allowed to prove itself, as it undoubtedly will, the probabilities are that the acquired deafness is as incurable as the congenital has proved itself to be. It is the bounden duty of all who, as parents or guardians of children so afflicted, are placed in positions of solemn responsibility, to exhaust every legitimate means to restore to these suffering little ones the enjoyment of a sense which so largely influences their future career.

There are thousands of cases of incurable deafness, originating from the diseases of childhood, which, if properly treated at their commencement, would have yielded to the measures employed, but from a combination of selfishness, laziness, and ignorance combined, on the part of those to whose care their early years were unfortunately committed, have been allowed to gravitate into conditions incapable of alleviation.

It is sometimes difficult in the early stages of infancy to judge of a child's hearing power, but at four months old, unless an infant is deaf, the attention will be attracted by some sounds; for instance, the ordinary play-things, such as a coral and bells. If at this age a child is insensible to all sonorous waves, a professional man should be consulted, and though at this period it is improbable that any direct treatment will be adopted, by having the case under constant observation, should even a slight power of perception to sound be possessed, judicious measures may largely assist to develope the sense; but if all attempts to awaken this power into activity are futile, then the earlier the child is taught under the present system of instruction to speak by the aid of the optic nerve, the more efficient will he become, and it is very interesting to observe, under this method of teaching, the proficiency of speech which may be acquired. It is long proved a mistaken idea that mutism is a necessary concomitant on deafness, and next to the endeavour to cultivate the sense of hearing, by which the power of speech is naturally acquired; failing that, it is incumbent that speech should be cultivated by the mode of teaching which is now so successfully practised.

Though much may be done in this way to remedy the consequences of the infirmity, the perfect power of hearing is necessary to the perfect faculty of speaking. In congenital deafness, though there is no positive data to go upon, the cause, if in the nerve, is most probably at its periphery. In many cases of congenital deafness which have come under my notice, the parents have remarked they felt certain the child heard occasionally. In some instances, when on a railway platform, and a train in motion—one striking instance of this occurred but last week, a most intelligent interesting girl, ten years of age, who has been under my care for some time, was brought to me. The mother was in great delight, as the child, on a railway whistle being sounded as she was getting out of another train, turned round and said "hark!" This naturally raised the parent's hopes, but I regretted I could not from this circumstance confirm them, as in several cases where vibrations communicated to the body were powerful and sonorous vibrations of a sharp character occurred at the same time, children and adults, who at other times seemed quite insensible to sound, were cognizant of it. If in the centre of the sense the loss of power lay, the vibrations communicated through the trunk could have no effect in arousing the nerve into action, but the powerful vibrations and sonorous undulations occurring together, would seem to have the power of momentarily overcoming the infirmity, and in consequence of this, which I have known to occur frequently, I base my opinion with regard to the part of the nerve which is incapacitated from action; the question would then arise, is it the nerve, or is it in the parts surrounding the nerve, that the true cause of congenital deafness originates?

In ordinary cases of deafness occurring in an adult who has at one time enjoyed the perfect sense of hearing, we deduce, by the application of sonorous bodies to the ear and surface of the cranium, whether the nervous or mechanical structure is at fault, and it might be thought that the same application of tests would decide in cases of congenital deafness, where the cause existed, but the cases are not analagous. The sense has never been stirred into action by the natural forces, and the ordinary vibrations employed to test the hearing power applied to the surfaces of the cranium, are insufficient to stimulate the nervous centre in the slightest degree, and therefore such proof, which is considered in ordinary cases as confirmatory of deafness arising from disease of the nerve, is, in cases of congenital deafness, not to be relied on.

It is a very doubtful point that the nerve is commonly the cause of the infirmity; even in those cases where the child is born deaf, the cause is more likely to rest in the condition of the labyrinth; the nerve may be in a perfectly healthy state, and of normal development, but unless the extremities of the nerve are irritated the centre is unaffected.

The optic nerve is quiescent, except under the stimulus of light to its terminal ends. The gustatory and olfactory nerve the same, and so likewise is the nerve of audition, and I believe, unless the terminating bulbous expansions of this nerve, situated in the labyrinth, are influenced in no other way or by no other channel, can the seat of the sense be reached, so that an abnormal condition of this structure is more likely to be the cause of congenital or acquired deafness than any direct affection of the nerve of audition. Pathological research is the only means by which these points can be satisfactorily proved, and, as yet, the opportunities for such have not been sufficient to establish them beyond dispute.

The five cases given by Mr. Toynbee of dissections made by him, where the subjects had been deaf and dumb from birth, in four of the cases the semicircular canals, membranous tubes, membrana tympani, lamina spiralis, were abnormal. In the fifth case the author could discover no unnatural condition of parts; and in the tabular statement, which he appends, of thirty-six cases dissected by different writers on this subject, in only one instance, that of Morgagni's, was the nerve unmistakeably the cause; in this case it was wanting. In the seven cases where the nerve was found in an abnormal condition, this condition may very possibly have been induced by want of action.

A very important question arises on considering the cases which different authors have detailed, viz.:—If congenital deafness should not be treated as soon as the fact is discovered, and treatment persevered in during infancy, childhood, and youth? Though we cannot by any means at our disposal undertake to stimulate nature to supply a congenital deficiency in the structure of the internal ear, nor from its position can art interpose, yet when pathological investigation reveals nothing in some cases, and insufficient causes in others to account for the infirmity, it is reasonable to imagine that nature had completed the formation which at the period of birth was deficient. The deafness being perpetuated from decadence of nerve power, simply from want of use.

If even one case in fifty were to prove successful, the trial would be well repaid; and when any conception of sound is possessed, persistent treatment should be employed to develope the sense, and it may be undertaken with fair prospects of at least partial success. Training the faculty of speech should go hand in hand with the other treatment. I believe no case should be abandoned as incurable without all curative measures have been fairly tried and proved vain. I am led to this opinion from the fact that it is almost always impossible for any one to judge during life of the cause of congenital deafness; and we should therefore surmise it to be removable until the contrary be proved.

Several of the cases given in Toynbee's table, such as scrofulous matter in the tympanum, calcareous concretions, gelatinous matter in the tympanum, tympanum containing a yellow fluid, thickened mucous membrane, &c., are all within the reach of our art to rectify, though the sufferers from these several causes were born, lived, and died deaf mutes, under the mistaken idea that congenital deafness must necessarily be incurable. It may, in a large proportion of cases, prove so, and such has been hitherto the rule ; but may this not have been from the feebleness and want of perseverance in the treatment engendered by the feeling existing, both in the mind of the parent and the physician, of the futility of all attempts to remedy the evil.

In all these cases the general condition of the system must be the first care, and scrofulous and other diseased tendencies combated by all means at our disposal ; counter-irritation behind the neck and auricle, with long-continued administrations of the preparations of iodine and mercury should be employed, keeping the system gently under the action of the drug. The child should be encouraged to mix and play with children of the same age, who are not similarly afflicted, for peculiarities of temper are usually evinced by children so circumstanced, they are often sullen and unmanageable.

It has been proved that congenital deafness is not an hereditary defect, as among those deaf mutes who have married and borne children, in some instances the infirmity existing in both parents, their offspring have enjoyed the sense in all its perfection.

Though the institutions for the deaf are of inestimable value to the poorer classes—if the parents are in a position to afford it, have the child taught to speak, but do not give up hope, and with hope all attempts to awaken the hearing power. The different institutions for the so-called deaf and dumb, turn all their attention to the former, considering the latter a hopeless task. This feeling I am anxious to combat, though, as I mentioned in the opening of the chapter, I can lay down few if any rules for treatment. There are a variety of phases of this affection, and a variety of complications which must be taken into consideration, and must govern all the remedial attempts which may be made. The patience and perseverance of the attendant will be largely taxed, but the possibility of success attending the surgeon's endeavours should outweigh the probability of failure.

For the treatment of congenital deafness the advancement of surgical and medical science has done nothing. As it was in past ages so it now is regarded by the profession and the public as incurable. I cannot help thinking much may be accomplished by judicious and long-continued treatment; though the medical man may be willing to undertake such a case, it is rarely the parents or guardians of the child will be willing to subject him to prolonged medical care ; and consequently many difficulties surround the question.

SOUND.

Perhaps there is no subject in connection with the human organism that has been more closely investigated by the few, and neglected by the many, than the subject of sound, and the structures by which it is conceived.

More than a century and a half ago it was demonstrated that a vacuum surrounding a body rendered that body incapable of originating sonorous undulations, and why? For the same body, when placed in the atmosphere we are breathing, vibrates audibly, in accordance with the force by which the vibrations are produced, because where the air, surrounding a body, is exhausted, though the body vibrates in itself, being surrounded by a vacuum, the vibrations communicate with nothing, and are therefore lost; but when they originate in an atmosphere of greater or less density, so, according to the condition of their surroundings, is their intensity regulated.

For instance, primary vibrations of equal power, of equal bodies, and from equal gradations of distance, but arising in a surrounding atmosphere of unequal elasticity, will strike on the ear with different force. The vibrations arising in the dense atmosphere will be loudly audible, while those communicated to the more rarefied fluid may be only barely perceivable.

As the body is thrown into vibratory action, so it communicates its vibrations to the atomic particles surrounding it, by which they are transmitted until the force with which they have been originated is expended.

Professor Tyndall has illustrated this by placing a number of balls in contact,—by striking the last ball motion will be imparted from one to the other.

Water gives a better illustration of the progress of sonorous waves by watching the circular undulations produced from a certain point by a disturbance of the fluid. This is beautifully portrayed by the Brothers Weber, and is to be found in that admirable and most interesting work on this subject by Tyndall.

The difference between the undulations of sound and the undulations of water is, that the agitations of the latter are on a plane, while the force of sonorous undulations is transmitted in all directions; but if a body is made to vibrate under water, then the impulse will be propagated in a like manner.

By watching the water running into a cavern, a fair idea of sonorous undulations entering the meatus externus may be conceived. The unyielding rock at each side of the entrance forms points of resistance, so that the returning and advancing mass of water form a conducting channel external to the entrance of the cavern. So in the sonorous undulations of sound: as the aerial waves strike the side of the head they rebound, except at the entrance of the meatus auditorius externus, which they enter with increased force, from the very great resistance portions of the waves have met with from the cranial parietes at each side; and it is here we can recognise the value of the auricle, with its peculiar formation, by which it collects these aerial pulses, and guides them into the concha, from whence they are forced on to the membrane of the tympanum.

The undulations are broken, but they unite as soon as the obstacle is passed, travelling on until the original force, which set them in motion, is exhausted, either by repeated interruptions, by which the undulations are so reflected as to speedily exhaust their power, or from gradual expenditure of force.

We are all familiar with the fact that violent vibrations, such as those caused by the discharge of powerful pieces of artillery, will break the ordinary window-glass within a considerable radius, though not facing the point of disturbance, and of this Professor Tyndall gives a very interesting example. When the Erith explosion occurred, in 1864, the windows of the town, though some miles distant, were all broken. In Erith church, where the windows were set in lead sashes, every window in the building was bent inwards, not one pane of glass being fractured. The violence of the commotion was here exemplified by the pressure which all the windows of the building were subject to, those immediately opposed to the centre of the agitation, as well as those facing in an opposite direction. The lead setting yielding to the external pressure was supported by the air inside the building, and was thus saved from further injury.

From this we may draw an analogy with the air contained in the middle ear, and the support which it affords to the membrane of the drum when exposed to undulations of a violent character.

In the opening pages of this work, a sketch of the development of the hearing organ—from the lowest step of the animal creation, where it is met with in a rudimentary stage, to that perfect organ by which sound is received and conceived—is given, and we find that a membranous sac, assimilating to the vestibule of a higher creation, is the first trace which is distinctly visible of the organ of hearing, proving that this is the most vital part of the sense, and that, as organisation advances, the different additions that are added are to meet the different necessities and requirements of the order, but that sound is received and conceived by an animal possessing only a rudimentary vestibule; but, as it will be shown, comparative anatomy teaches us that such animals are incapable of receiving distinctions of sound, sonorous vibrations of all kinds probably conveying the same sensations.

In the class reptilia, that portion of the aural mechanism called the cochlea is first met with, and the power of conceiving harmonious vibrations is an attribute of the order. The fact of snake charmers handling with impunity the most venomous reptiles under the influence of harmonious sounds is well known. This advances us another step : we gather from it that the variety of impressions the human ear is capable of receiving is from the perfect formation of the cochlea.

In birds there is an external auditory canal, which may possibly be more for the admission of air and lightening the weight of the body, than for any special requirement of the tribe ; but in the pinnacle of the mammalian order, "the human being," we find the full development of the structure, each component part necessary to his requirements, and the efficiency of the whole depending upon their perfect development and normal condition.

Though man possesses the vestibule, or internal ear, in common with a very low order of the animal creation, and the perfect organ in common with all the mammalian class, the greater capacity and power is due, not to any additional structure in its composition, but to a more exquisite nervous, and to a higher sensorial, development.

The only structural difference among most of the mammalian order is in the formation of the auricle. Among aquatic mammals the auricle is necessarily small, and among carnivora it is smaller than in the herbifora. In the latter class it would seem to be enlarged for the purpose of collecting vibrations of sound arising from a distance, so as to enable the animal to escape from danger. In the seal, the mole rat, the zemni rat, and the walrus, the auricle is absent.

It has been frequently contended that the auricle is more for ornament than use ; it would be the only part of the frame that is so were these assertions correct, which, however, they are not. The opportunity of judging of the diminution of hearing power, consequent on the loss of the auricle in the human being, is of rare occurrence except as a congenital condition, where it is rarely the only malformation existing in the structure; but the result of its loss has been demonstrated by Kerner, who cut off the right ear of a cat. After the wound healed the animal kept its head turned, the left side outwards; on plugging the left ear the animal was entirely deaf, except to sounds of a clear and loud character.

A simple way of proving the value of the auricle in man is to get two pieces of board cut out—one in the form of the external ear, simply boring a hole through the other to represent the meatus externus. Direct a stream of water at each; a much larger quantity will flow through that which is corrugated and grooved out, to represent the formation of the auricle, than will find its way through the hole bored through an even surface.

A perfect auricle stands out from the head at its unattached part. When listening to anyone talking—for instance, a clergyman in church—it is easy to test the additional acuteness of hearing which is acquired by placing the hand behind the ear, and directing it still more forward, the free edge of the auricle, assisted by the hand, forms a larger point of resistance to the sonorous undulations, reflecting them in the same manner as a polished concave surface throws back the rays of light; the reflected and advancing waves rush into every crevice or space in their immediate radius, and consequently, flow into the meatus auditorius externus with increased power, and by that increased power cause the membrana tympani to vibrate more powerfully.

The sonorous undulations having now travelled from the vibratory body are impinging on the membrane of the drum, which by their force is made to vibrate, and by its attachment to the chain of ossicles, by the handle of the malleus, which is embedded in the folds of which this membrane is composed, it sets this chain in motion; the stapes, the other end of the chain, being intimately attached to the membrane which guards the entrance to the internal ear, the fenestra ovalis pulls it backwards and forwards, which agitates the fluid contained in this structure, in which the bulbous expansions of the auditory nerve terminate; the irritation so conveyed to them is transmitted to the main trunk of the nerve, and by it to the origin and centre of the sense, where sound is conceived.

We can follow it thus far, but beyond this lies a mystery which mortal mind cannot fathom. The distinctions, prolongations, and almost infinitesimal degrees of sound, of which the human ear is capable of receiving, are due to the cochlea, semi-circular canals, cretaceous bodies, and bristles of Max Schultz, which are to be found in the labyrinth, and the power of counteracting the effect of powerful vibrations is not only regulated by these yielding sacculi, containing fluid in which the extremities of the nerves are pillowed, but another opening in the internal ear, called the fenestra rotunda, covered by an elastic membrane, which separates it from the tympanum, forms an outlet, where the structure guarding it yields according to the force with which the fluid is propelled against it, thus diminishing the power with which the nerve would be acted upon were the rude oscillations of the fenestral membrane communicated to a dense fluid contained in an unyielding structure.

The distinctions of sound must be produced by the chords of which the cochlea is composed, discovered by Corti to be a perfect musical instrument, and, according to Kölliker, consisting of three thousand strings or fibres. The bristles, discovered by Schultz, and the minute bodies called otolithes, are supposed to prolong the effect of those minute vibrations, which would otherwise be so evanescent in their effect as to be scarcely conceivable. While the tympanum is of an irregular formation, the internal ear has regularly-formed elliptical chambers, which, by some, are supposed to focus the pulses of sound. But I think this is very doubtful.

There are many different degrees and powers of hearing. Helmholtz states its entire range to embrace seven octaves ; according to Woollaston it is nine octaves, and the practical range of musical sounds is comprised between forty and four thousand vibrations a second. This is the supposed power of a perfectly healthy and normal organ, but there are many persons who do not possess such a comprehensive auditory structure, and yet get through life very comfortably. There are instances on record of people who could not distinguish one tune from another, and of others similarly circumstanced, who, after severe fevers, in which the brain had been seriously engaged, on recovery, were found to possess perfect musical ears.

EAR TRUMPETS.

THE mechanical contrivances for increasing the failing powers of audition are too numerous to particularise, but as a rule, they all merit equal condemnation, no matter of what shape or what substance they are formed. That they increase the perception of the sense is manifest to all those persons who, suffering from a greater or less deterioration of it, resort to one of these aural appliances to remedy the defect. The immediate result, in many such cases, is all that can be desired, and the sufferer is consoled with the hope that an acoustic instrument will be ever potent to overcome the infirmity; a fatal delusion. Temporarily it produces the desired effect, but at the expense of permanent mischief.

It is necessary to remember, that it is impossible for any acoustic contrivance to affect the sense of audition, except by more powerfully concentrating the undulations of sound on the membranes of the tympanum, either by confining the pulses, as in the ordinary pliable tube or ear trumpet in common use, or by exposing a larger orifice for the entrance of the aerial vibrations, by means of a trumpet-shaped instrument fixed at the entrance of the meatus auditorius externus; beyond this, acoustic instruments are valueless. Cophotic people who early seek such means for overcoming their infirmity, may be likened to a man who has erected an iron water tank, which, for a time has perfectly answered the purposes for which it was intended; from some cause or another, a small leak occurs in the tank, instead of seeking for this and rectifying it he turns on a greater pressure of water, and by this means overcomes the effect of the leak; but as time goes on, the mischief also goes on, necessitating increased water supply to combat the increased evils, which eventually become so great as to baffle all counteracting agencies. So, with regard to deafness, some affection of the aural structures occurs, interfering with the efficiency of that mechanism by which sonorous vibrations are communicated to the auditory nerve, diminishing the acuteness of the sense.

The use of one of these instruments further concentrates the sound waves, conducting them with increased force on to the membranes, and the result of early disease is for the time overcome; but that disease which is the cause of the diminished hearing, is left in undisturbed possession of the auditory structure, increasing day by day, it ultimately attains such proportions as to defy the counteracting agencies of increased conducting power. For this reason, if for no other, the use of mechanical appliances for overcoming deafness is to be condemned, for in those cases where their use corrects the consequences of aural disease, as the disease advances, the patient's attention is directed not to the subjugation of the cause, but to the amelioration of its effect. And in the long run, the disease will prove the conqueror.

If acoustic appliances improve the hearing power, the disease which is the cause of its impairment, is not beyond the pale of direct surgical treatment. Another very serious question arises concerning the effect of sound-concentrating instruments on the nervous centre, and the serious symptoms which may be initiated by the powerfully stimulating effect they produce on the auditory nerve.

In many diseases of the eye, an important part of the treatment consists in guarding the organ from the stimulating effect of too powerful light, and the necessity of guarding the ear, in some of its diseases, from the effect of too powerful vibrations, is not sufficiently remembered.

STATISTICS.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
J. R.	Male	32	Furunculi	3 months	Not visible.
G. E.	Female	26	Otorrhœa	from birth	Destroyed.
H. F.	do.	28	do.	2 years	Hypertrophied.
A. B.	do.	17	Catarrh	7 months	Relaxed.
F. F.	Male	28	do.	3 months	Normal.
H. H.	do.	44	Eustachian obstruction	7 years	Collapsed.
G. L.	do.	38	Kick from a horse	8 years	Perforated.
C. J,	do.	25	Furunculi	2 months	Normal.
J. W.	Female	21	Scarlet fever	14 years	Perforated.
H. M.	Male	24	do.	20 years	Thickened.
C. W.	do.	17	Catarrh	2 years	Relaxed.
A. B.	Female	15	Myringitis	2 days	Inflamed.
K. W.	do.	4	Meatitis	1 week	Congested.
G. C.	do.	19	Ceruminous deposit	3 months	Normal.
W. F.	Male	8	Foreign body	3 weeks	Ruptured in previous attempt at extraction.
J. D.	Female	61	Tinnitus	4 years	Hypertrophied.
G. S.	do.	41	Wound from a pin	20 years	The edges only visible.
M. D.	do.	7	Scarlatina	8 months	Perforated.
E. C.	do.	22	Ceruminous deposit	3 days	Normal,
J. W.	do.	21	Scarlatina	14 years	Perforated.
R. G.	Male	46	Ceruminous deposit	10 months	Normal.
E. C.	Female	6	Polypus	4 years	Relaxed.
G. C.	Male	59	Meatitis	2 weeks	Congested.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
J. C.	Female	24	Fauces inflamed	3 weeks	Normal.
C. O.	do.	34	Catarrh	2 years	Collapsed.
E. F.	Male	32	Otorrhœa	12 months	Ulcerated.
D. E.	do.	23	Eustachian obstruction	6 months	Relaxed.
J. H.	do.	28	Scarlatina	21 years	Perforated.
A. P.	do.	16	Scarlatina and Ozæna	10 years	Hypertrophied.
H. L.	do.	3	Scarlatina	2 years	Perforated.
R. C.	do.	32	Variola	20 years	Hypertrophied.
C. P.	Female	27	Catarrh	4 years	Relaxed
T. G.	Male	28	Ceruminous deposit	3 months	Normal.
E. D.	Female	8	Eczema	12 months	Not visible.
T. G.	Male	21	Catarrh	3 years	Relaxed.
E. L.	do.	16	Fauces congested	3 weeks	Normal.
A. H.	Female	70	Catarrh	2 weeks	do.
F. P.	Male	13	Scarlatina	10 years	Hypertrophied.
C. H.	do.	28	Otorrhœa	from birth	Extensively eroded.
W. H.	do.	20	Catarrh	12 months	Relaxed.
G. G.	do.	7	Stone in the meatus	10 months	Normal.
J. S.	do.	49	Ceruminous deposit	3 weeks	do.
G. N.	do.	39	Syphilitic Ozæna	8 months	Relaxed.
A. B.	do.	15	Polypus	5 years	do.
A. H.	Female	54	Tinnitus	4 months	Normal.
J. T.	Male	35	Scarlet fever	10 years	Perforated.
H. A.	do.	8	Scarlatina	3 years	Hypertrophied.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
W. B.	Male	16	Parotitis	4 days	Normal.
S. D.	Female	50	Tinnitus	5 years	Hypertrophied.
L. W.	Male	22	Ceruminous deposit	2 months	Congested.
R. M.	do	40	Rheumatism	10 years	Concretions on surface.
F. W.	Female	6	Otorrhœa	1 month	Normal.
J. C.	Male	6	Polypus	not known	do.
H. B.	do.	7	Scarlet fever	6 weeks	Perforated.
A. C.	do.	9	Otorrhœa and Ozæna	3 months	Relaxed.
A. D.	Female	3	Congenital	from birth	Normal.
L. B.	do.	13	Scrofula	do.	Relaxed.
T. S.	Male	52	Ceruminous deposit	3 weeks	Normal.
W. P.	do.	18	Polypus	not known	do.
G. P.	do.	9	Fauces inflamed	3 weeks	Relaxed.
J. G.	Female	64	Ceruminous deposit	6 months	Normal.
A. B.	do.	19	Anæmia	12 months	do.
S. W.	do.	50	Otorrhœa	1 month	do.
S. B.	do.	16	Eustachian obstruction	12 months	do.
J. P.	Male	22	Scarlet fever	17 years	Perforated.
A. E.	Female	26	Catarrh	5 years	Very relaxed.
R. C.	Male	32	do.	20 years	Much hypertrophied.
E. H.	Female	42	do.	3 weeks	Normal.
A. W.	do.	20	Scarlatina	2 months	Patches of ulceration.
M. P.	do.	33	Catarrh	2 years	Relaxed.
R. D.	Male	19	Strumous	from birth	Tumefied.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
W. P.	Male	17	Scarlet fever	11 years	Extensively eroded.
W. W.	do.	16	do.	from infancy	Much relaxed.
H. C.	do.	40	Ceruminous deposit	2 months	Normal.
D. G.	do.	17	Otorrhœa	17 years	Much disorganized.
W. H.	do.	21	do.	6 years	Disorganized.
E. C.	Female	15	Scarlet fever	9 years	Both perforated.
J. P.	Male	23	Otorrhœa	from birth	Much hypertrophied.
K. D.	Female	5	Scarlatina	1 year	Relaxed.
H. P.	Male	21	Eustachian obstruction	1 year	Abnormally concave.
W. C.	Female	27	Eczema	3 months	Normal.
H. G.	Male	19	Scarlatina	6 years	Hypertrophied.
A. B.	do.	15	Polypus	not known	Ulcerated.
W. L.	do.	22	Otorrhœa	8 years	Hypertrophied.
E. B.	Female	23	Otorrhœa	4 years	Relaxed.
E. M.	do.	23	Catarrh	9 months	Discoloured.
T. W.	Male	48	Otorrhœa	10 years	Perforated.
G. P.	do.	17	Scarlet fever	6 months	Normal.
J. R.	do.	30	Rheumatism	8 years	Thickened.
C. P.	do.	6	Meatitis	2 months	Discoloured.
M. R.	Female	42	Catarrh	3 months	Relaxed.
F. M.	Male	10	Polypus	7 years	Normal.
J. L.	do.	57	Eczema	10 years	Not visible.
S. B.	Female	27	Scarlet fever	22 years	Extensively eroded.
E. A.	do.	15	do.	11 years	Perforated.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
W. T.	Male	30	Artificial perforation	12 years, increased last 4	Puckered.
M. S.	Female	56	Ceruminous deposit	6 years	Congested.
E. G.	do.	38	Scarlet fever	2 years	Perforated.
A. M.	do.	46	Myringitis	4 days	Much congested.
C. B.	Male	15	Eczema	1 month	Not visible.
W. B.	do.	49	Inflammation of internal ear	46 years	Not recognisable.
W. M.	Female	31	Furunculi	3 months	Not visible.
E. G.	do.	25	Meatitis	2 months	Congested.
E. F.	do.	6	Scarlatina	2 years	Thickened.
E. L.	do.	24	Polypus	12 years	Normal.
W. F.	Male	19	Catarrh	2 years	Concavity abnormal.
L. P.	Female	15	Anæmia	3 years	Normal.
R. S.	Male	24	Not known	5 years	Thickened.
Q. W.	do.	17	Scarlet fever	2 years	Perforated.
F. M.	do.	8	Polypus	4 years	Thickened.
J. P.	do.	21	Meatitis	Chronic	Much disorganised.
W. H.	do.	19	Ceruminous deposit	3 weeks	Normal.
E. F.	Female	23	Anæmia	6 months	do.
M. B.	do.	48	Catarrh	6 months	Opaque.
R. D.	do.	14	do.	4 years	Concavity abnormal.
M. H.	do.	40	Chronic rheumatism	20 years	Much disorganised.
E. B.	do.	27	Scarlet fever	10 years	Perforated.
A. M.	do.	21	do.	6 years	do.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
M. D.	Female	2	Irritation set up at birth	2 years	Not visible.
A. H.	Male	46	Otorrhœa simplex	1 year	Thickened.
A. R.	Female	17	Blow on the head	3 days	Ruptured.
M. D.	do.	2	Otorrhœa, irritation from teething	6 months	Discoloured.
J. A.	Male	5	Enlarged tonsils, congested throat	6 months	Normal.
G. N.	Female	10	Scarlatina	2 years	Perforated.
E. H.	do.	17	Anæmia	9 months	Normal.
G. L.	Male	24	Catarrh	6 months	do.
G. P.	do.	30	Not known	15 years	Collapsed.
R. W.	do.	34	Meatitis	1 month	Not visible.
R. S.	do.	36	Ceruminous deposit	3 weeks	Normal.
W. O.	do.	23	Scarlet fever	4 years	Perforated.
W. W.	do.	20	Ceruminous deposit	3 months	Normal.
A. C.	Female	23	Enlarged tonsils, congested throat	5 years	Concavity abnormal.
H. C.	Male	14	Scarlet fever	3 years	Much thickened.
M. R.	do.	30	Ceruminous deposit	6 months	Normal.
M. H.	Female	45	Typhus fever	6 years	Collapsed.
W. H.	Male	8	Polypus	1 year	Normal.
M. R.	Female	57	Ceruminous deposit	3 months	do.
S. L.	do.	29	Anæmia	4 months	do.
M. E.	do.	54	Catarrh	12 months	Thickened.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
B. P.	Female	6	Scarlatina	3 years	Perforated.
A. E.	do.	20	Congested throat, enlarged tonsils	3 weeks	Normal.
L. W.	do.	37	Ceruminous deposit	5 weeks	Normal.
T. R.	Male	57	Scarlatina	50 years	Shrivelled.
T. K.	do.	14	Concussion of the brain and polypus	7 years	
C. S.	Female	11	Hooping-cough	4 years	Perforated.
M. B.	do.	37	Anæmia.	12 months	Normal.
W. W.	Male	30	Fall on the head	9 months	do.
J. B.	do.	29	Catarrh chronic	14 years	Collapsed.
L. M.	do.	28	Meatitis	3 weeks	Congested.
W. F.	do.	30	Otorrhœa from cold	3 years	Soddened.
M. H.	Female	18	Catarrh	2 years	do.
F. W.	Male	46	Otorrhœa from cold	9 years	Perforated.
J. M.	do.	41	Not known	11 years	Much thickening.
J. M.	do.	62	Catarrh	7 months	Thickened.
C. L.	do.	66	Ceruminous deposit	6 months	Normal.
J. G.	do.	50	Rheumatic	10 years	Thickened and collapsed.
H. C.	do.	34	Ceruminous deposit	4 months	Congested.
W. T.	do.	56	do.	5 weeks	Normal.
S. F.	do.	17	do.	12 months	Congested.
W. M.	Female	51	Meatitis	1 month	Inflamed.

Initials.	Sex.	Age.	Cause of Deafness.	Duration.	Condition of Membrana Tympani.
M. R.	Female	22	Injury from a pin	4 years	Perforated.
W. K.	Male	17	Ceruminous deposit	6 weeks	Normal.
M. B.	Female	19	Scarlet fever	9 years	Perforated.
E. B.	do.	16	do.	4 years	do.
M. F.	do.	19	do.	7 years	do.
M. H.	do.	4	Otitis	2 weeks	Inflamed.
C. P.	Male	5	Anæmia and Struma	6 weeks	Normal.
M G.	Female	9	do.	4 years	Opaque,
W. F.	Male	27	Catarrh	6 weeks	Thickened.
S. L.	Female	52	Ceruminous deposit	1 month.	Normal.

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In the foregoing tables the author has not carried out his original intention of giving five hundred cases, though that number was prepared for publication; but, on going through the list, it appeared that the first two hundred were a fair example of the whole; and, as condensation of the subject has been the aim, the remaining cases have been omitted. Those given presented themselves for treatment on consecutive days, and are noted in their order. The term collapsed, in describing the condition of the membrana tympani, is used to denote an aggravated form of relaxation; in either case the membrane bulges inwards. The term hypertrophy is used to denote an excessive thickening of its coats; and the term meatitis seems to the author to properly characterise the affection which has hitherto been described as inflammation of the meatus externus.